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The Socioeconomic Achievement Gap in Mathematics

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by

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Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work at Lindenwood University and that I have not submitted it for any other college or university course or degree.

Adam Meador

Signature: Adam Meador ____________ Date: 3-25-11

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Abstract

Currently in the United States a gap exists in the education of high and low socio-economic students. There is an education available for the socioeconomically challenged and a different system of education for those who live in a higher socioeconomic status. The purpose of this study was to explore the achievement gap in mathematics for elementary students. Specifically, the gap between the students' scores who attended a school with a free and reduced price meal percentage below 25% and students' scores who attended a school with a free and reduced price meal percentage above 75% was explored. Additionally, the focus of this study was to examine the mathematical strands with the greatest difference in achievement between the two groups. Identification of specific achievement gaps in mathematics could lead to a more individualized program of instruction and focused curriculum for students in poverty and those who are not performing at the same level as peers. The landmark differences between the groups were used to identify the gaps between student performances in both growth during the academic year and achievement on the content strands. The quantitative research questions were supported by students' scores on the Missouri Assessment Program test, Performance Series test, and Star Math test; data were used to apply a *t*-test to document significance, a Pearson *r* to demonstrate correlation, and a review of landmarks to document trends in the data. A qualitative research question was supported by interviews of building principals and provided a human perspective. Significant differences in growth were not noted in the study. The difference between content strands on the Performance Series test did not yield significant results. However, in a study of five years of Missouri Assessment Program data there were three content strands: number and operation, algebra, and measurement which were identified as having significant differences in students' scores.

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Chapter One: Introduction

Background

In the United States, poverty is an increasing social concern. Poverty is increasingly more evident in schools. In recent years, "… schools where at least three-quarters of students are eligible for free or reduced-price meals – a proxy for poverty – climbed from 12% in 2000 to 17% in 2008" (Khadaroo, 2010, para. 1). Observing the trends in public education Marzano (2003) noted, "For decades, educational researchers, educational practitioners, and the public at large have assumed that socioeconomic status is one of the best predictors of academic achievement" (p. 126).

The No Child Left Behind (NCLB) Act includes sanctions on schools not meeting the targeted benchmarks, which highlighted students who scored below proficient (Whitney, 2002). In 2009, the American Recovery and Reinvestment Act (ARRA) was introduced in an attempt to help a struggling economy, and over one hundred billion dollars was invested in education alone (United States Department of Education [USDOE], 2009a). The money was ear-marked for programs which would increase achievement for all students in an attempt to close the achievement gap (USDOE, 2009a).

Progress toward closing the achievement gap was evident between 2007 and 2009 (MSNBC.com, 2009a). In 2009, the National Assessment of Educational Progress (NAEP) assessment scores confirmed the recent significant growth in mathematics had slowed down (National Center for Educational Statistics [NCES], 2009c). Tomsho (2009), who covered the release of the 2009 scores, stated, "U.S. Math scores hit a wall" (para. 1). Tomsho (2009) further discussed the lag in test scores by U.S. students and how fewer than 40% of 4th and 8th graders scored proficient on the test. It was noted there had been significant gains on every NAEP test since 1990 (Tomsho, 2009).

In 2001, the Missouri Department of Higher Education (MDHE) launched a K-16 task force with the directive to study and eliminate the achievement gap in Missouri. The members of the task force believed the elimination of the achievement gap was an "ethical imperative" (MDHE, 2001, p. 1) which needed to be addressed. The task force found that "achievement gaps in Missouri are most prevalent among schools with large concentrations of poor and minority students. Missouri's urban schools are particularly challenged since the urban schools have high proportions of low-income and minority students" (MDHE, 2001, p. 2).

In one urban Missouri public school district, the achievement gap has been studied carefully (Maddox, 2004; Morgan, 2007; Richardson, 2005). In an effort to reduce the achievement gap, the district expanded Wonder Years, an early childhood program, to address the achievement gap for students who are eligible for the free and reduced price meal (F/R) program (Morgan, 2007). In a 2001 study of the district, an achievement gap based on socioeconomic status was evident; however, due to the low percentage of the minority population in the district, a minority achievement gap was not found (Richardson, 2005). Steps were taken to address the achievement gap by setting goals to address "reducing the dropout rate…and improving student achievement" (Richardson, 2005, para. 9).

Conceptual Framework

Various theorists have added to the understanding of the teaching and learning processes of students of poverty or low socioeconomic status (Jensen, 2008, 2009; Payne, 2007). A modern theorist contributing to this issue is Payne, (2007) who has completed extensive research of poverty and how students living in poverty operate within a school system. The work of Jensen (2006, 2009) led to an understanding of how the brain functions as students learn different subjects. Jensen (2009) also performed extensive research concerning how the brain of a student in poverty is different and how the student needs to be taught in different ways to ensure understanding. Also, Dewey, an early educational researcher from the late 1800s into the early 1900s, Piaget who worked on child intelligence from the mid 1950s until 1980, and Vygotsky who worked on the concept of cognitive development in the early 1900s, were known for research in the processes of learning, the stages of learning, and early research into the differences between students. Dewey (1954), Piaget (1950), and Vygotsky (1993) made contributions to understanding the processes of learning for students in poverty.

Statement of the Problem

In 1965, President Lyndon B. Johnson delivered the Great Society Speech, most noted as the War on Poverty. This speech brought to the forefront a nationwide awareness and attempt to overcome achievement gaps (Johnson, 1965). More recently, Bracey (2002) argued that in the United States two very different school systems are in place: one for the poor and minority students and the other for the rest of the population. For example, an analysis of recent Missouri standardized test scores revealed a gap between the performance of students in low socioeconomic areas and areas of greater wealth (MODESE Public Information, 2009). In 2009, 51% of students in Missouri scored below the proficiency level (NCES, 2009c). Missouri’s recent Race to the Top application was denied citing that Missouri was making little effort in the use of laws, policies, or regulations to increase educational reform and innovation in student achievement and narrowing achievement gaps (Simms, 2010). In a discussion by Gordon and Rebell (2007) of a fair and equal education for all students, it was noted:

> The annual price tag of inadequately educating our young people is staggering, in the realm of $250 billion per year in health and welfare costs, criminal justice expenses, and lost tax revenues. The heavy toll on the social and civic fabric of the nation is an additional, inestimable price that we all pay every year. (p. 1840)

The difference in the educational systems based on students' socioeconomic statuses has been a matter of national concern for years (Bracey, 2002; Johnson, 1964). In 2009, the government allocated over one hundred billion dollars in an attempt to repair the differences in educational systems (USDOE, 2009a).

Purpose of the Study

The purpose of this study was to examine the difference in student growth in mathematics using the STAR Math and Performance Series of elementary students in a Midwestern school district. Also, the mathematical strands and achievement levels of the students were examined to identify the specific achievement gaps between students of high and low socioeconomic status as determined by the Performance Series and Missouri Assessment Program (MAP) tests. The mathematical strands are: algebraic relationships, geometric and spatial relationship, data and probability, measurement, and number and operations (MODESE Public Information, 2009). Additionally, face-to-face interviews with building level principals were conducted to gather their perceptions of student achievement based on socioeconomic status.

Research Questions

The following research questions guided the study:

1. What difference exists in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

2. What difference exists in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

3. What difference of student scores exists within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

4. What difference of student scores exists within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

5. How do building level principals perceive the mathematical academic performance of students from high and low socioeconomic status?

Independent Variables

The independent variables in this study were the schools with a F/R population of above 75% and the schools with a F/R population below 25%.

Dependent Variables

The dependent variables in this study were the student scores on the MAP, STAR Math, and the Performance Series Mathematics test.

Null Hypotheses (H_0)

1. There is no significant difference in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

2. There is no significant difference in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

3. There is no significant difference of student scores within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

4. There is no significant difference of student scores within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

Alternative Hypotheses (H_1)

1. There is a significant difference in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

2. There is a significant difference in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

3. There is a significant difference of student scores within the five

mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

4. There is a significant difference of student scores within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

Significance of the Study

According to Khadaroo (2010), the number of schools with at least 75% of the school population receiving F/R had increased by 5% over the past eight years. Identification of socioeconomic achievement gaps could assist teachers in creating appropriate lesson plans, guide school boards and district level administration as they appropriate monies for the budget, assist building level administrators to become better instructional leaders for students living in poverty, and lead to a more focused instruction for the students who do not perform at the same level as peers. Focused instruction for students in poverty, starting in the classroom and building to the district level, may also prove to be a viable strategy in narrowing or closing the achievement gap.

Definition of Key Terms

The following terms are defined to identify the mathematical significance and clarify the terms for this study:

Achievement gap. For the purpose of the National Council of Teachers of Mathematics (NCTM) Achievement Gap Task Force (2004), the achievement gap was identified as "an indicator of disparities between groups of students usually identified by racial, ethnic, linguistic, or socioeconomic class with regard to a variety of measures" (p. 2).

Algebraic relationships strand. Procedures and identification of algebraic symbols and "the connections of algebra with number and everyday situations" (Mirra, 2004, p. 4).

Data and probability strand. In this strand "students collect, organize, and display relevant data to answer questions they have formulated" (Mirra, 2004, p. 4).

Diversity. The "differences among groups of people and individuals based on ethnicity, race, socioeconomic status, gender, exceptionalities, language, religion and geographic region" (MODESE, 2008a, p. 2).

Free and reduced price meal (F/R). Students qualify for free and reduced price meals based on the household income and the number of family members who reside in the same residence. The current guideline for a family of four is annual earnings of just over $40,000 to qualify for the reduced meal program and just over $28,500 to qualify for the free meal program (United States Department of Agriculture [USDA] Food and Nutrition Service, 2010).

Geometric and spatial relationships strand. Within the geometric and spatial relationship strand, "students analyze characteristics of geometric shapes and make mathematical arguments about the relationships among them" (Mirra, 2004, p. 4).

Grade level expectations. For the state of Missouri, "expectations represent the Department's latest effort to explicate the Show-Me Standards, in order to help local educators articulate precise learning outcomes for students" (MODESE, 2008c, para. 1).

Measurement strand. The measurement strand "includes understanding the attributes, units, systems, and processes of measurement, as well as applying appropriate techniques, tools, and formulas to determine measurements" (Mirra, 2004, p. 4).

Missouri Assessment Program (MAP). Missouri's standardized test is "one of several educational reforms mandated by the Outstanding Schools Act. The MAP is responsible for developing performance-based assessments that measure student achievement on the Show-Me Standards" (MODESE, 2005, p. 27).

Number and operations strand. In the lower grades, students use whole numbers for comparisons and counting. For students in higher grade levels, fractions and integers are used more often. The procedures and formulas of how to use these numbers are also part of this strand (Mirra, 2004).

Performance Series by Scantron. A computer-adaptive test that pinpoints the proficiency level of students, across a range of subjects, which corresponds with the specific standards of each state (Scantron, 2009).

Poverty. The New World Encyclopedia defined poverty as "a condition in which a person or community is deprived of, or lacks the essentials for a minimum standard of well-being and life" (New World Encyclopedia, 2007, para. 1). A family of four in the United States who makes less than $22,000 is living in poverty (U.S. Department of Health & Human Services, 2010).

Proficient. Students demonstrating an understanding of the skills and processes identified by the state or national standards (MODESE, 2008b).

Socioeconomic status. Based on a family's income level and can be used as an identifier for diversity (MODESE, 2008b).

STAR Math Test. An online assessment tool used to measure student performance in mathematics. Once the students are finished with the test a quick report is generated for the teacher (Renaissance Learning, 2009).

Title I. A government program used to provide additional funds to economically disadvantaged students (MODESE, 2008b).

Limitations

The following issues were identified as limitations to the data collection and the type of data collected for this study:

1. Elementary schools with a F/R percentage above 75% and below 25% were studied, which limits the study by not including all of the schools in the district.

2. Student data from one urban public school district were gathered instead of all public schools in Missouri.

3. The number of years of data was limited due to recent changes in the testing schedule of the Mathematics MAP.

4. The Performance Series had been used district-wide since 2009, the STAR Math was previously used; however, the limited testing windows impacts the amount of data available for study.

5. Student scores from grades three through five were studied; this allowed for consistency among teaching practices and curriculum. Additional test results were available from grade six through eight, but not used in the study.

6. Students may not be correctly identified for participation as F/R due to the families' choice to complete the paperwork.

7. Only the federal definitions for the F/R program were used in determining

socioeconomic status.

Assumptions

The following assumptions were made as part of the collection and study of data:

1. All students within the same classroom are treated equally.

2. There was equal distribution of students with special needs in the two groups: schools with a F/R percentage above 75% and schools with a F/R percentage below 25%.

3. Teachers followed the district-provided curriculum pacing guide and testing sequence.

Design Controls

Controls were put in place to provide as accurate results as possible for the data. Students were compared using the same testing windows. Data were collected from three different standardized assessments: the STAR Math, Performance Series, and the MAP. The student data were retrieved from a neutral source, the district accountability office, which collected the data for use in one of the district computerized information warehouses.

Summary

Nation-wide, gaps based on race, gender, and socio-economic statuses have been identified as impacting educational performance. These gaps had been a focus for the government since 2005. There exists an achievement gap between students who attend a school with a high percentage of poverty and those who attend a school with low percentage of poverty (NCEE, 2007; USDOE, 2009b). With an awareness of this gap, researchers have examined how students living in poverty develop learning strategies for reading and mathematics (Jensen, 2006, 2009; Payne, 2007).

The purpose of the study was to explore the achievement gap in mathematics for elementary students. Specifically, the gap between the scores of students who attended a school with a F/R percentage below 25% and scores of students who attended a school with a F/R percentage above 75% was explored. Additionally, the focus of this study was to examine the mathematical strands with the greatest difference in achievement between the two groups. Identification of specific achievement gaps in mathematics could lead to a more individualized program of instruction and focused curriculum for students in poverty and those who are not performing at the same level as peers.

In Chapter One, the introduction, statement of the problem, research questions, variables, hypotheses, significance of the study, definition of terms, limitations, assumptions, and design of the study were discussed. The review of related literature and research related to the problem investigated, the conceptual frameworks provided by Payne and Jensen, as well as the current issues students in poverty face were presented within Chapter Two. In Chapter Three, the methodology and procedures used to gather data for the study were detailed. The results of analyses and findings to emerge from the study were contained in Chapter Four. In Chapter Five, a summary of the study and findings, conclusions drawn from the findings, a discussion, and recommendations for further study were presented.

Chapter Two: Review of Literature

Poverty and the achievement gap related to socioeconomic differences are problems at all levels of the country: national, state, and local (Yen & Sidoti, 2010). Due to a current recession, the percentage of students living in poverty is rising (Yen & Sidoti, 2010). In a recent article, Yen and Sidoti (2010) described the poverty rate growing to one out of every seven Americans. The number of children in poverty was also expected to rise to nearly 20% (Yen and Sidoti, 2010). Nearly half of all children will receive food stamps at some point during childhood (MSNBC.com, 2009b).

In order to more fully explore the problem of the socioeconomic achievement gap in the United States, current articles on the state of poverty and education in the United States were reviewed. The purpose of this review of literature was to narrow the focus of the achievement gap so educators may be able to develop plans to close the gaps within their communities. The review of current literature will help to identify the size of the gap and the reasons why the gap needs to be addressed. National test scores, current researchers, noted theorists, and national programs to support high poverty students were reviewed in Chapter Two.

Klein (2009) found if the socioeconomic achievement gap was closed it would produce a 3-5% increase of the gross domestic product. The difference between socioeconomic groups within the United States, as well as differences between students in the United States and their counterparts across the world can create a significant long-term negative impact on the economy (Klein, 2009). Klein (2009) noted, “It adds financial urgency to the moral urgency” (para. 11). Klein (2009) reported no one knew how much it would cost to close the gaps, which would then lead to a better economic outlook.

Understanding the connection between student performance and socioeconomic status is an important first step in identifying the gaps in performance on standardized testing (NCES, 2007b). Each state has a different standardized test, so it is difficult to compare state to state (NCES, 2007b). A 2007 NCES report comparing the 2004-2005 state scores for proficient and basic with the NAEP proficient and basic scores actually found a negative correlation between the two (NCES, 2007b). The researchers believed this negative correlation was due to the many different types of assessments and the different proficiency standards from state to state (NCES, 2007b). The national government uses the NAEP test to compare the data between the states. Not every student will take the NAEP; instead, it is a sampling of students from the 4^{th} and 8^{th} grades from various economic backgrounds in each state (NCES, 2009c). In 2009, 168,800 fourth graders and 161,700 eighth graders completed the NAEP test in both private and public schools (MSNBC.com, 2009b; Tomsho, 2009). Since state expectations vary on assessments, the NAEP is used to compare nationwide student data for Title I (USDOE, 2009b). Title I is a national program which provides extra monies to schools with high percentages of students who qualify for F/R (USDOE, 2009b). Also, local test score averages were used as part of the Title I research to identify ways to help meet the needs of students living in poverty conditions (USDOE, 2009b).

The gap between students of high and low socioeconomic status has been a focus for the national government for many years; President Lyndon Johnson passed the first Elementary and Secondary Education Act (ESEA), giving money to schools from the national level (LBJ Library and Museum, 2009). In 2010, President Barrack Obama pushed for a revision of the current ESEA (Anderson, 2010a; Anderson, 2010b; Robelen, 2010). The new revision of ESEA focused on growth instead of a pass-fail system (Anderson, 2010a; Anderson, 2010b; Robelen, 2010). The revision also increased funding for states willing to go to a national system of curriculum and assessment, in which all students are ready for either a career or ready to attend college (Anderson, 2010a; Anderson, 2010b; Robelen, 2010). If the gap is going to be closed, education experts have to research various ways to help do so. Two current researchers, Jensen (2006, 2009) and Payne (2007), were chosen to frame this study. These researchers have studied the brain and student development as the student progresses in his/her learning.

The data and research used by the experts will be used to lay the groundwork for understanding how students learn and how students who live in poverty learn in a different way than peers not in poverty. (NCEE, 2007; Payne, 2007; USDOE, 2009b). Recent research has been conducted concerning how students in poverty learn and how the students' brains developed differently (Jensen, 2006, 2009; Payne, 2007); therefore, the works of Payne (2007) and Jensen (2006, 2009) provided the conceptual framework for this study. The works of Vygotsky (1993), Piaget (1950, 1952), and Dewey (1897, 1954) provided the theoretical background to better understand the development and learning processes of students.

Data Reports

National test data. In a NCES (2008a) report, the point was argued by the researchers that closing achievement gaps is the federal government's job; "A primary objective of the federal involvement in education is to ensure equal education opportunity for all children, including minority groups and those living in poverty" (p. 4). The researchers of NCES (2008a, 2008b) believed there are several federal and national programs with the goal of reducing the achievement gap. Representing the achievement gap by a number is a difficult process and hides various factors of student achievement for the federal programs (NCES, 2008a, 2008b).

In a study for mathematical equality, Lubienski (2002) argued the existence of a socioeconomic gap based on F/R status. Lubienski (2002) collected data to demonstrate a gap of 17 achievement points between students receiving and not receiving F/R on the fourth grade mathematics NAEP for White students, a difference of 16 points for Hispanic students, and a difference of 19 points for Black students. There was a gap of 20 points between the achievement levels of White students compared to the Black students and a gap of 17 points between the achievement levels of White students compared with Hispanic students. However, even within the ethnicities, there was a socioeconomic achievement gap (Lubienski, 2002). Lubienski (2002) attributed many of these differences to the instructional tools used by teachers from calculators to computers and even the type of test given. Researchers found, in a study of administering the NAEP on a computer, scores could be skewed for Hispanics, Blacks, and minorities due to the lack of familiarity with the technology (NCES, 2005a).

Data from previous NAEP tests can be interpreted to show a steady incline of scores since 1990 with the achievement gap narrowing (NCEE, 2007; NCES, 2007a). Recently, academic growth has ceased and the gap is now remaining constant (Tomsho, 2009). Researchers compared the NAEP mathematics data from 1973-2004 and found a 22 point increase in student achievement scores over the time period for fourth grade students taking the test, from 219 in 1973 to 241 in 2004 (NCES, 2005b). Researchers continued to find average student scores increasing for students who scored in the 10th, 25th, 50th, 75th, and 90th percentiles since 1978 (NCES, 2005b). At this point in the NAEP, the USDOE did not use F/R status as a socioeconomic marker; instead student reported parent education level was used as the indicator (NCES, 2005b). However, researchers were concerned with fourth grade students being able to report this data accurately for reliability (NCES, 2005b).

Reports are created periodically (NCES, 2007a) to document student progress on the NAEP; data can be traced back to 1969. Data in a report for 18 large urban districts (NCES, 2006c, 2007d, 2009d) were compared to study students in the nation's largest districts with the national results; within the fourth grade results in mathematics gaps between the nation and urban districts of two points were found. Data in the NCES (2006c, 2007d, 2009d) reports showed the large cities had 71% of the students who qualified for F/R. Only 46% of the students nationwide qualified for F/R (NCES, 2006c, 2007d, 2009d). Found in the mathematics results from the NCES (2007c, 2007d) were scores increasing for all students, but a gap still existed between national results and results from the large urban districts. The NCES (2007c, 2007d) reported a 27 point increase for fourth graders on the mathematics section of the NAEP, over the 17 previous years; two points higher than 2005 results. Compared to 2005, 14 states improved in both fourth and eighth grade and eight states improved in only fourth grade (NCES, 2007c, 2007d). Scores showed an increase for F/R students in the NCES (2007c, 2007d) report. However, all students increased maintaining an achievement score gap of 13 points for full pay students and reduced students, and a gap of 24 points for full pay students and free students from the previous NAEP mathematics test (NCES, 2007c, 2007d). According to data provided by NCES (2007c, 2007d), 42% of the students tested in fourth grade mathematics qualified for F/R, in grade four all student groups increased, keeping achievement gaps stagnant. Data from an NCES (2009b) report tracking student progress from the early 1970s demonstrated growth for all students, but in recent tests, the students' scores had not increased as exponentially as historically represented. In over three decades of student progress checks by the NAEP, the achievement gaps between groups have narrowed, however gaps still remain between different subgroups taking the test.

The most recent results of the NAEP, reported by the organization NCES (2009c, 2009d), were unchanged from 2007 in fourth grade mathematics, keeping gaps consistent. The average score for fourth graders in mathematics who qualified for free lunch increased one point; however, students who did not qualify for F/R lunch increased one point, keeping the 24 point gap in place (NCES, 2009c). In the focus on urban districts fourth grade mathematics scores remained consistent for the large districts as well, an average score gap of eight points between the large districts and nation remained (NCES, 2009c). While 48% of the students tested qualified for F/R, an increase of 2% from 2007; 71% of students in the large districts qualified for F/R (NCES, 2009c, 2009d).

A report by Council of the Great City Schools (CGCS), which studied NAEP achievement in larger city schools, found 67% of the cities narrowed the socio-economic achievement gap for fourth grade students on the NAEP (CGCS, 2010). The cities in the study accounted for 14% of the student population of the country (CGCS, 2010). Of these students, 60% qualified for F/R and, and 41% of the students nationwide qualified for

F/R (CGCS, 2010). It was documented that 79% of the districts in this study increased the scoring of fourth grade students who qualify for F/R to proficient on the NAEP (CGCS, 2010). Compared to the national results, students who qualified for F/R in large cities was less, 20% of students in large cities compared to 22% of the students nationwide (CGCS, 2010).

Another national assessment, along with the NAEP, is the Trends in International Mathematics and Science Study (TIMSS). The NAEP uses samples to compare student achievement from state to state (NCES, 2006a, 2007a). The TIMSS is a test to compare United States students to students in other countries (NCES, 2006a, 2007a). The NCES (2006a, 2007a) further explained the NAEP and TIMSS are similar in the breakdown of the questions into the five mathematical content strands. Even with the similar questions on both the NAEP and TIMSS, improvement was only noted on the NAEP (NCES, 2007a). United States fourth graders scored 11 points higher than the average of all countries on the TIMSS, and of the 16 countries taking the assessment, eight increased achievement scores, including the United States (NCES, 2007a).

Missouri test data. Missouri uses the MAP test to assess districts for accountability and to meet the NCLB standards. Schools in Missouri have a goal to reach Adequate Yearly Progress (AYP), which is based on several criteria: graduation rate, attendance, and percentage of students scoring proficient or above on the mathematics and communication arts sections of the MAP test (MODESE, 2010). The goals for percentage of students graduating and attendance percentage remain constant each year (MODESE, 2010). However, the target goal for students scoring proficient or advanced increases each year in order to meet the standards set by NCLB (MODESE, 2010).

Schools also reach the mathematics and communication arts goals by students progressing at a constant rate towards proficiency, or increasing the percentage of students scoring advanced or proficient (MODESE, 2010).

In a recent NAEP release, a comparison between the states' proficiency standards was completed and Missouri's standards scored among the highest in the country in mathematics, second in 4th grade and fourth in 8th grade (MODESE Public Information, 2009). However, even with highest standards, there has been a separation, or gap, in the performance of students (MODESE Public Information, 2009). Missouri has some students who take the NAEP. A study by Barton (2002), found that although Missouri fourth grade mathematic NAEP scores had increases in the ten years from 1990-2000; the scores had increased across all levels, keeping the achievement gaps consistent. Barton (2002) demonstrated the gap in 2000 was 24 achievement points, which was just a one point decrease since 1992. The most recent results from the NAEP for Missouri found average fourth grade student mathematical scores increasing two points over 2007. The fourth graders averaged a score two points higher than the national average for fourth graders (NCES, 2009c). Of fourth grade students in Missouri 41% scored at the proficient or above level on the 2009 mathematical NAEP (NCES, 2009c).

In a NCES (2007b) report, state test results were compared to NAEP test results and established that in 2003, 126 schools were studied, and 37% of the students met the proficient mark on both the MAP and NAEP mathematics tests. In 2005, of the 141 schools studied, 41% of the students met the proficient mark on both the MAP and NAEP (NCES, 2007b). A 2008 report by the Schott (2009) foundation documented in Missouri that 17% of the students who received F/R in Missouri had access to well-supplied, high-performing schools. Researchers for the Schott Foundation (2008) also found that 34% of the students who received F/R lunch were in poorly-resourced, low-performing schools.

Researchers completed a study comparing the 2003 state and NAEP fourth grade mathematics test results (NCES, 2008b). For Missouri, researchers used 126 schools participating in both the NAEP and the MAP in 2003; nearly 64% of the students in the sample were considered to be disadvantaged (NCES, 2008b). Nearly a 20 percentage point difference on the MAP was found between the highest achievers from both the disadvantaged and not disadvantaged students (NCES, 2008b). Both disadvantaged and not disadvantaged students scored the same on the NAEP at the lowest achievement levels, but an achievement gap quickly developed and remained fairly constant (NCES, 2008b). In comparing the MAP to the NAEP, the students scoring in the lowest quartile scored better on the NAEP, and students scoring in the highest quartile scored better on the MAP (NCES, 2008b). A significant difference on the fourth grade mathematics NAEP and MAP tests was not found for students in poverty (NCES, 2008b).

Concern for the performance of students in Missouri resulted in a committee by the state higher education department with a mission to eliminate the achievement gap (MDHE, 2001). Although the state found the largest achievement gaps were in urban areas, such as Kansas City and St. Louis, with a higher concentration of poor and minority students (MDHE, 2001). Other urban districts in the Missouri study did not have a large enough minority population to demonstrate a minority achievement gap (Richardson, 2005).

Student achievement is measured at the school level, and if a school meets goals preset as part of NCLB, then it has met AYP. If a school does not meet AYP, it is considered to be in improvement level one (NCEE, 2007). Of all schools in Missouri, 12% were in improvement (NCEE, 2007). Of these schools, 84% were Title I schools; this number is 18% of all Title I schools. By 2007, most scores which were identified as needing improvement were in 3% of the districts across the country (USDOE, 2009b). Schools rarely missed AYP due to one subgroup (USDOE, 2009b). More often it was all students or multiple subgroups (NCEE, 2007). Schools in urban areas with higher concentrations of minority and poor students were more likely to be marked for improvement (USDOE, 2009b).

According to data provided by the USDOE (2009b), for school year 2006-2007, Missouri had 105 schools identified for improvement, which is 5% of all Missouri schools. All of these schools were Title I schools, which is 10% of all Missouri Title I schools (USDOE, 2009b). Of these 105 schools, 24 were in year one of improvement, 64 were in year two, and 17 were in year three (USDOE, 2009b). In school year 2007-2008, the number of schools in improvement increased to 197 Title I schools in Missouri (USDOE, 2009b).

Title I. Title I was created in 1965 with President Johnson's War on Poverty and the signing of ESEA of 1965 (Walker & Mohammed, 2008). Also during this time, the NAEP had been given as a nationwide measure of student achievement (Walker & Mohammed, 2008). Walker and Mohammed (2008) reported during the early years, little evidence was given to the narrowing of the achievement gap. Due to the lack of evidence of impact on the achievement gap, part of NCLB included an accountability piece for the national Title I program (Walker & Mohammed, 2008). Schools were to make AYP based on standards set by each state; if a school did not make AYP, the school would be placed in improvement (Walker & Mohammed, 2008). If the school did not make AYP by the third year, the school would then face sanctions (Walker & Mohammed, 2008). Walker and Mohammed (2008) believed the government did not take into account the needs and differences for a Title I school, and the increments each year for students to improve was too great for high poverty students to achieve.

Independent agencies, which track Title I schools, provided additional data (USDOE, 2009b). These reports included student growth on the NAEP and other standardized tests (USDOE, 2009b). The agencies studied all elements of the Title I schools to insure the appropriate use of government subsidized monies, expenditures, and how the expenditures were used to improve the learning conditions for Title I students (USDOE, 2009b). The agencies tracked the use of Title I monies through state performance reports, state accountability reports, state teacher certification documents, and NAEP student test scores (NCEE, 2007; USDOE, 2009b). The agencies also reviewed the curriculum taught in these schools for reading and mathematics (NCEE, 2007; USDOE, 2009b). The agencies focused on the early elementary grades due to the gaps which can be filled in quickly with high quality instruction; the groups wanted to make sure the curricula were effective and to measure the sustained impact on achievement in mathematics (NCEE, 2007; USDOE, 2009b).

When NCLB went into effect in 2002-2003, a reauthorization of Title I was part of the act (NCEE, 2007; USDOE, 2009b). Part of these authorizations made the accountability for the program stronger (NCEE, 2007; USDOE, 2009b). The new authorization required a national assessment be put into place and an Independent Review Panel, which conducted a longitudinal study to review the implementation and impact of the program (NCEE, 2007). Title I money went to 93% of the school districts across the country and 56% of the public schools (NCEE, 2007). Nearly 20 million students were served by the program in 2004-2005 and 188,000 of those students attended a private school (NCEE, 2007). Financially, the funding has increased to nearly $12.8 billion in 2007; three-fourths of the expenditures went to schools with a large amount of poverty (NCEE, 2007). The high poverty schools received less *per student* than low poverty schools; the funding is primarily used for teachers and instructional support (NCEE, 2007).

The National Center for Education Evaluation and Regional Assistance (2007) released a report in which researchers compared documented test data on the NAEP and state level assessments. Positive growth was reported particularly in mathematics (NCEE, 2007; USDOE, 2009b). For the states which had many years of data available, the amount of students reaching the proficient level has increased in most of the states studied; however, most states are not projected to meet the 100% proficient target of NCLB (NCEE, 2007; USDOE, 2009b). According to data provided in a USDOE report (2009b), only three of the 27 states studied were on track for 100% of the students to score proficient on state assessments by the 2013-2014 school year. For fourth grade, an upward trend for high poverty schools and in some states the achievement gaps between disadvantaged students had narrowed (NCEE, 2007). Student test scores on state assessments could not be used to compare state to state, but could be used to make comparisons within the state (NCEE, 2007; USDOE, 2009b). Student scores on the NAEP should not be compared with state test scores due to the limited sample sizes within states (USDOE, 2009b).

The Title I report also summarized teacher quality for the schools served by the program (NCEE, 2007). Highly qualified teachers who taught in high poverty schools tended to have less experience or were teaching out-of-field compared to low poverty schools (NCEE, 2007). Teacher quality had to do with recruitment; most high poverty schools had trouble recruiting and retaining these teachers due to low poverty schools nearby providing higher pay rates and more favorable working conditions and the high poverty schools were also more likely to offer financial incentives or use alternative certifications (NCEE, 2007; USDOE, 2009b). According to the report by NCEE (2007), teachers in high poverty schools also attend professional development in reading and mathematics more often than peers in low poverty schools.

Schools in improvement try different strategies to improve student achievement, such as driving instruction based on data and providing additional instruction (USDOE, 2009b). Most schools do not alter the instruction time. Instead, the schools use interventions listed as part of NCLB (USDOE, 2009b). For part of the interventions, schools must offer outside agencies for student interventions. States have developed structures to monitor and evaluate the providers (USDOE, 2009b).

Poverty as a Problem

National. Differences in class systems have been around since the beginning of written history, which can be dated back to 3100 B.C. (Guisepi, 2006). Each of the early civilizations in Mesopotamia, Egypt, Indus Valley, Huang He Valley, Crete, and Central America all had class systems in place (Guisepi, 2006). America was not as aware of the differences until after World War II and the GI Bill (Harris & Herrington, 2006). Many people were allowed to get an advanced education (Harris & Herrington, 2006).

This new abundance of education led to higher expectations of education, and class systems in the United States became more apparent (Harris & Herrington, 2006). Families living in poverty formed the lower levels of the class system (Harris & Herrington, 2006). President Johnson signed into effect the ESEA, April 11, 1965, which was the first bill providing national support for education for all levels from first grade through college (LBJ Library and Museum, 2009).

Szabo (2010) and Yen (2010) described the percentage of children living in poverty growing to over 20%. With a recession during the last part of the first decade of the twenty-first century, an increase in the percentage of the population in poverty could lead to progress made for children in poverty to be wiped out. According to Yen (2010), 15% of all Americans would be in poverty based on the outcome of the 2010 census. The United States Census Bureau (USCB) (2008) conducted a study on poverty and found most people in poverty do not remain in poverty for very long. Poverty is a chronic condition for a very small percentage of the population (USCB, 2008). Nearly 2% of the population lived in chronic poverty during the time of the study (USCB, 2008). The USCB (2008) found during the time of the study, "39.2 million people lived in poverty in any given month in 2001" (p. 7).

Payne (2007) found America has a high poverty rate which is two or three times higher than that of other western industrialized nations. According to Payne (2007), children born in poverty are more likely to be affected by developmental delays and give birth during teen years. Children in poverty are more likely to be in a single-parent family (Payne, 2007). Nearly 54% of children less than six years of age, living in a single parent family, were likely to live in poverty compared to nearly 10% of children less than six years of age living in a traditional family (Payne, 2007). The achievement gaps studied have life-long effects, “high juvenile delinquency, low occupational outcome, low lifetime incomes, high rates of mental illness, low marital satisfaction, short life span, high risk of teenage pregnancy, school dropout, gang involvement, welfare dependence, and drugs and alcohol abuse” (Taylor, 2005, p. 259). Sherman (2008) discussed the larger number of minority students being impacted by the achievement gaps; three times as many Blacks are living in poverty as Caucasian students.

A NCTM task force on the achievement gap (2004) discussed the “achievement gap is not a result of membership in any group, but rather is the result of the systematic mistreatment of learners caused by racial and class bias” (p. 2). Harris and Herrington (2006) explained how achievement gaps have been troubling for those who think education should serve to equalize life choices for all. Harris and Herrington (2006) argued that the gap has shifted from an indicator of inequalities in education to a cause of these inequalities. Gordon and Rebell (2007) believed to become a true global society a comprehensive approach is needed to give all an equal opportunity without regard to a child’s background. A report published by The Schott Foundation (2009), called on the American education system “to make access to a high-quality opportunity to learn a federally guaranteed right for every American. We cannot have equity without quality. And cannot have true quality without real equity” (p. iii). Braun, Wang, Jenkins, and Weinbaum (2006) completed a state-by-state analysis of the use of Title I funds and test outcomes. The authors concluded it would be a challenge for American educators to raise achievement and close the gaps between students (Wang, Jenkins, & Weinbaum, 2006).

The achievement gaps are a national problem; “the achievement gap affects schools across America and has been identified as a crisis by both the Bush and Obama administrations” (Frahm, 2010, para. 8). As the number of students living in poverty is growing, schools have to change as well (Belden, 2009). Schools which once had 20% of the students from low income homes are now educating 40% of students who are considered low income, which affects the subgroups for AYP. Kenning (2010) detailed a Louisville school where 91% of the students qualify for F/R; students come to school lacking basic medical care and clothing. Kenning (2010) described the blending of the school as a place of instruction and a social-service center for the community. Unmuth (2010) reported a Texas school which has also blended its focus as well, from a place of education for students, to a place for education for the community; this school has 89% F/R and outstanding test scores. Otterman and Gebeloff (2010) noted the progress in New York City schools. The city has closed 91 poor performing schools and established about 100 charter schools; the schools have also offered financial incentives for families to meet the needs of students, such as getting them to the dentist and having good attendance (Otterman & Gebeloff, 2010).

In 2010, Secretary of Education Duncan referred to education as “the civil rights issue of our generation” (“Civil Rights Leaders,” 2010, para. 5; Williams, 2010, para. 1). Williams (2010) referred to education as a national mission and the best hope for the future. Duncan argued NCLB has done some things correctly but needed improvement in other areas (Question and Answer, 2010). He spoke of ideas to improve education, such as increasing the time spent in school, increasing the amount of quality teachers, giving schools the resources they need, and closing or restaffing ineffective schools (“Civil

Rights Leaders," 2010; Question and Answer, 2010). Duncan told a Congressional committee to close the achievement gap, education must be approached in new and inventive ways, because it is not state against state. Instead, it is the United States competing against the entire world ("ESEA Reauthorization," 2010). Connelly (2010) conducted an interview with Secretary Duncan, in which Duncan commented "Our goal is easy to articulate and hard to get there. It's to make sure every child has access to world-class education. Race, social and economic status, zip code, neighborhoods shouldn't matter" (p. 34).

In 2009, the federal administration created stimulus programs to provide money for education and attempt to restart the economy (USDOE, 2009a). More money has been made available through competitive grants by the states (USDOE, 2009a). The goal of the federal government is to have a nation-wide system of standards and assessments to measure the growth of these standards with the belief funds and expectations could help improve the education of low income students (Anderson, 2010a; Robelen, 2010). The funding would impact the Title I monies tied to the current ESEA by changing the system from a pass-fail type system to one in which growth is more important (Anderson, 2010a; Anderson, 2010b). Also, under the new system, the lowest of performing schools would be closed or restructured to make schools more accountable (Anderson, 2010b).

The support for federal monies to fund education started with President Johnson and the War on Poverty (Guskey, 2007; LBJ Library and Museum, 2009). Programs starting under this campaign included the Economic Opportunity Act which established the Head Start Program and ESEA which created the Title I program (Guskey, 2007; LBJ Library and Museum, 2009). President Johnson's programs provided money to reimburse the schools for serving breakfast and milk to the students (LBJ Library and Museum, 2009). The ESEA, in the most recent form, is labeled NCLB; this program held schools accountable for different subgroups, such as poverty level, ethnicity, language, and disability (Guskey, 2007).

NCLB was compiled by Congress in 2001 and was considered to be revolutionary because it focused on achievement gaps and the support of civil rights (Sherman, 2008). This mandate called for reports from different subgroups; these subgroups are based on socioeconomic status, ethnicity, language, and disability (Guskey, 2007; Northwest Evaluation Association [NWEA], 2005; Whitney, 2002). NCLB was intended to hold schools accountable, increase opportunities for students not performing as well, enhance the ability for students to become proficient, and reduce the achievement gaps in many of the subgroups (NWEA, 2005). It was also a national reform which could provide one system of accountability for the entire nation by requiring 100% of students meet standards by 2014, establishing uniform sanctions for not meeting benchmarks (NWEA, 2005). As a result, mathematics has improved over the past two years; however, student growth has decreased, and mathematics gains are greater than reading gains (NWEA, 2005).

Currently in mathematics in the fourth grade, 14 states have reduced the gap between the top and bottom quartiles, two states reduced the gap between the White and minority students, but only one state reduced the gap between students receiving and not receiving F/R meals (Barton, 2002). Harris and Herrington (2006) found large gaps exist for students of poverty entering kindergarten as much as one standard deviation between students from poverty and students not from poverty. Other gaps between the two groups are demonstrated in “student mobility, birth weight, lead poisoning, nutrition, reading time, television watching, and parental attention” (Harris & Herrington, 2006, p. 237). Braun et al. (2006) found schools serving large numbers of economically disadvantaged students had higher numbers of new or unqualified teachers, as well as, a lack of funding. There is a belief local intervention is not enough. Taylor (2005) reported, “Community alone cannot close achievement gaps any more than schools alone. The combined effort and investment of both are necessary and sufficient to close achievement gaps associated with race and class” (p. 266).

Missouri. The Schott Foundation (2008) found Missouri does not rank high in the nation for support of disadvantaged students. Missouri ranked 42nd in providing all students an opportunity to learn, 35th for early childhood education, 42nd for highly qualified teachers, 30th for instructional materials, and 26th for college preparatory curriculum (Schott Foundation, 2008). Missouri recently applied for Race to the Top funding and was found to not have favorable education reform laws or policies to increase student achievement, graduation rate, or reduce the achievement gap (Simms, 2010).

In 2001, the Missouri Department of Higher Education (MDHE) created a task force to study the effects of poverty on students in Missouri (MDHE, 2001). The task force found achievement gaps in Missouri occur most often with poor and minority students in large groups which are most evident in urban areas (MDHE, 2001). The task force (2001) also found gaps can be identified in MAP and ACT scores, graduation rates, and the types of courses students take at college. One of the focuses of the task force is teacher quality to help eliminate the achievement gap; the task force believes eliminating the achievement gap would be beneficial to Missouri because it could generate more productive citizens (MDHE, 2001).

Local. The district in this study nearly did not meet accreditation 10 years ago, so the district refocused its attention on using data to get back on track (Richardson, 2005). There were two goals; improving graduation rate and improving student achievement, thus narrowing the gap (Richardson, 2005). Richardson (2005) noted the district used study groups within schools to examine how teaching was conducted and how relationships impacted the students. Maddox (2004) proposed that the district had a gap between the dropout rate of Blacks and Whites. In 2000, the dropout rate for Black students was nearly 14.5%, and for White students the percentage was just above 7%. The district improved those numbers; by 2004 the rate for Blacks was 5.4%, while for Whites it was just under 5% (Maddox, 2004).

The district changed the way Title I monies were appropriated. Riley (2010a) noted the district went from using the money specifically on the Title I programs to a school-wide approach, where the money could be of benefit to more students. The district received over $7 million each year as part of the Title I funding (Riley, 2010a). The funds are divided among the schools with a F/R percentage greater than 50% (Riley, 2010a). The greater number of students receiving F/R equates to more money going into the school (Riley, 2010a). The district also used Title I monies to provide a pre-kindergarten experience for students of poverty in an attempt to narrow the gap before students reach kindergarten and ARRA money was used to expand the program (Morgan, 2007; Riley, 2010b; Riley, 2010c). Riley (2010b) described the need for the program as an opportunity to catch students early and close the gap. The program places students with the highest need first, to target the neediest.

Understanding Poverty

Payne (1998, 2002, 2007) is one of the modern theorists on the education of students in poverty. Payne (2007) found students in higher socioeconomic groups and students in lower socioeconomic groups were very similar without regard to their ethnicity. Payne (2007) defined poverty two different ways: first, generational poverty, a family living in poverty for at least two generations; and situational poverty when there is a lack of resources due to an event. Students living in generational poverty are perceived as having an attitude of everyone else owing them something, where students in situational poverty still have a sense of pride and refuse to accept charity (Payne, 2007) Payne (2007) described students in situational poverty as having more resources and the more formal register of education. Payne (2007) found education and relationships are the two elements which can release a student from poverty.

Payne (2002) shared the work of cognitive scientists who believed 50% of the brain is formed by genetics and 50% is formed by environment. Students who do not have diversified experiences in their environment need a different approach to teaching and learning; they need the how, what, and why in order to build patterns and develop on future learning (Payne, 2002). Teaching the whole student and helping a student in poverty to overcome current generational or situational poverty was Payne’s (2007) focus. Payne (1998) believed many staff and curriculum development models do not provide adequate training for staff to address the needs of all students, in particular students in poverty. An example is a student needing help. A parent from a higher socioeconomic bracket will hire a tutor or provide other assistance. A student in poverty will have his or her needs addressed at school, and often the school and teachers are not prepared due to lack of curriculum development and/or training (Payne, 1998).

Students in poverty have difficulty with the concept of time (Ellis, 2004) due to an unpredictable and fragmented environment. Because of this environment, students have difficulty orienting themselves to a time system. Ellis (2004) believed students without an internal reference system are not able to understand how events are sequenced. Students need an understanding of time management for completing and accomplishing tasks and assignments, and students in poverty tend to think in the present and are not able to plan for the future (Ellis, 2004).

In researching poverty, Payne (2007) found the average IQ for students in poverty is nine points lower than the average IQ for a student living in a middle class family. Assessments given in many classrooms are knowledge based tests, and students living in poverty do not have the same knowledge base as their higher socioeconomic peers, so teachers need to consider how students in poverty learn and how they should be taught (Payne, 2007). Students in poverty have a different vocabulary register than what is expected in a school setting, which could impact the understanding of mathematical terms used in a classroom (Payne, 2007).

Payne (2007) also gave insight into the reasons why a student living in poverty faces educational disadvantages. The three things students in poverty need are insistence, expectations, and support not only at school, but more importantly, at home, and as Payne (2007) reported, “What seems more important than involvement and coming to school by parents is whether parents provide insistence, expectations, and support at home. Perhaps we need to rethink the focus of parent training" (p. 107). Payne (2007) reminded educators that the role of an educator of a child who is living in poverty is not to save that child; instead, it is to provide the tools needed to increase success. Long (2008) described a technology gap which could affect impoverished students' abilities to communicate online or use the tools which are available through the internet since access is limited in most cases to time at school or in the library (Long, 2008). Long (2008) believed this gap in technology could affect the achievement gap and impact students' earnings potential later in life.

Recent reports documented students living in poverty and students in higher socioeconomic classes grow academically about the same each school year (Benson & Borman, 2007; Mathews, 2010; Swanson, 2007; Toppo, 2010; Viadero & Johnston, 2000; Von Drehle, 2010). The gap grows over the summer (Benson & Borman, 2007; Mathews, 2010; Swanson, 2007; Toppo, 2010; Viadero & Johnston, 2000; Von Drehle, 2010). Swanson (2007) and Toppo (2010) reported all students can lose 2.6 months in mathematical skills over the summer, but economically disadvantaged students suffer more of a loss due to the lack of summer experiences. These gaps become accumulative and students fall further behind each year. Benson and Borman (2007), Mathews (2010), Viadero and Johnston (2010), and Von Drehle (2010) supported the Swanson (2007) documentation of accumulative loss demonstrating by ninth grade, two-thirds of the achievement gap can be connected to summer learning loss. Toppo (2010) and Von Drehle (2010) agreed by the end of elementary school, low-income students are three grades behind socioeconomically advantaged peers.

Mathews (2010) and Von Drehle (2010) described several community organizations' attempts to overcome the achievement gap by having summer learning programs aimed at students having fun while learning. Bracey (2009) identified the loss of learning students in poverty face over the summer, while middle class families might travel, go to libraries or museums, play organized sports, and even have family game nights; students in poverty watch TV or play video games frequently during the summer. Caro, McDonald, and Willms (2009) documented the positive relationship between family socioeconomic status and academic achievement. Caro et al. (2009) supported research findings that the achievement gap presents early in life and the gap increases as the student progresses through educational careers. Caro et al. (2009) documented the gap does not change during the school year, but is enhanced during the summer due to gaps in summer activities (Benson & Borman, 2007; Mathews, 2010; Swanson, 2007; Toppo, 2010; Von Drehle, 2010).

While Mathews (2010), Swanson (2007), Toppo (2010), Viadero and Johnston (2000), and Von Drehle (2010) reported increased achievement gaps over the summer, students in poverty have other issues to be concerned with over the summer. Eisler and Weise (2009) reported over 20 million students in the United States receive government subsidized breakfast and lunch. For some students, these are the only meals they will eat, so over the summer, the lack of food is a concern for many students. Jalonick (2010) found the number of students eating government subsidized meals in the summer and 16% of students who qualified for F/R in 2009 took part in a summer program. Jalonick (2010) discovered for some of the students, the meals provided at the school were the only meal for the day. Lubrano (2010) described the conditions in Philadelphia where over 150,000 students who receive F/R in the school year need meal assistance in the summer as well. Nearly 80,000 of the students have received meals as part of the summer meal programs in the city (Lubrano, 2010).

Other districts provided different ways to support the students (Schrader, 2009). While some districts bus students to desegregate schools by race, other schools have used busing to spread out the high concentrations of poverty. According to Schrader, (2009) more than 60 districts across the country used socioeconomic status as a means to determine school assignments. McCrummen and Birnbaum (2010) and Rotherham (2010) found low income students performed better when the students were placed in schools of lower concentrations of poverty. Students in the district studied had been placed by socioeconomic status. After seven years of busing, high poverty students placed in low poverty schools scored eight percentage points higher than peers in high poverty schools (McCrummen & Birnbaum, 2010; Rotherham, 2010). Harris and Herington (2006), McCrummen and Birnbaum (2010) and Rotherham (2010) depicted schools which have lower concentrations of students living in poverty as schools which have more stable teaching staffs, less problems with discipline, and have more community support through volunteers. Rotherham (2010) further documented the narrowing of the achievement gap through socioeconomic desegregation describing a school district which had implemented socioeconomic segregation cutting the achievement gap in mathematics in half. Even though socioeconomic desegregation has found positive results in large districts where busing students is possible, only 281 school districts in the country have student populations greater than 25,000; therefore, busing for many is not an option (Rotherham, 2010).

The number of high poverty schools, where at least three-fourths of the students qualify for F/R, is increasing. These schools will face many challenges (Khadaroo, 2010). Grootenboer and Hemmings (2007) and Nagel and Neuschwander (2009) reported mathematics is greatly influenced by socioeconomic status as well as ethnic background. Williams and Lemons-Smith (2009) reported for the United States to overcome and close the achievement gap, educators need to stop focusing on the achievement gap; instead, educators should focus on the inequities which contribute to the gap. Robelen (2009) found high poverty students placed in a focused charter school outperformed peers in public school in New York City due to a large amount of supplemental services provided by the charter schools.

Lubienski and Lubienski (2005, 2006) argued with the common belief that students in private school perform better than public schools. While conducting research, the researchers controlled income factors and found public school students actually performed better than private school peers. Lubienski and Lubienski (2005, 2006) found the average scores for private school fourth grade students on the mathematics NAEP test scored six points higher than public school peers taking the same test. However, when dividing the students into four quartiles based on socioeconomic status, public school students outperformed private school peers in each of the quartiles; there are more public school students in the lower socioeconomic quartiles (Lubienski & Lubienski, 2005, 2006).

The research conducted by Books (2004) provided insight into the conditions which a student living in poverty faces on a daily basis. Books (2004) and Williams (2003) addressed the disparities between schools with a low percentage of students who qualify for F/R and those schools with a higher percentage. Books (2004) did not offer suggestions concerning how to teach students in poverty, but to understand the challenges faced by students. Books (2004) cited groups of studies which documented students who did not qualify for F/R but were in a high poverty school scored lower on tests than high poverty students in a low poverty school. Students, without regard for socioeconomic status, scored lower on tests when half of the students in a school qualified for F/R (Books, 2004). These scores decrease further if the school has more than three-quarters of the students qualifying for F/R (Books, 2004). Books (2004) documented students in the lowest socioeconomic group have an average score 60% lower than students in the highest five socioeconomic groups. Books (2004) concluded “socioeconomic status accounted for more of the variation in cognitive scores than any other by far” (p. 143).

Fay and Fay (2009) connected to Maslow’s hierarchy of needs and developed a pyramid of needs in which physical well-being, love and belonging, and control are the basic needs of all students; however, students in poverty do not have many of these needs met. Because their basic needs are not being met, students have difficulty learning new subject matter (Fay & Fay, 2009). Only new learning which helps the students to reach the fulfillment of needs is assimilated (Fay & Fay, 2009). Williams (2003) provided theories on how to make a difference in the lives of all students; theories ranged from focusing on the type of teacher who teaches in a high poverty school to the change of the reform agenda to ensure everybody is on the same page. Williams (2003) also presented ideas for instruction, as well as ways to improve the high poverty schools.

According to Boyd-Zaharias and Pate-Bain (2008), school improvement is not enough, because schools alone cannot improve the social class of students. One of the suggestions of the study was to reduce student mobility (Boyd-Zaharias & Pate-Bain, 2008). Boyd-Zaharias and Pate-Bain (2008) found one-third of the students in poverty will attend three schools by third grade. Boyd-Zaharias and Pate-Bain (2008) proposed 17% of the achievement gap could be eliminated by keeping students at one school for many years. Holland (2007) conducted an interview with Richard Rothstein and Katy Haycock, two leading educational researchers, on closing the achievement gap. Rothstein believed to close the achievement gap, the national government needs to take steps to reduce poverty, and then schools can help the students once they are able to learn (Holland, 2007). Haycock argued students with high expectations can grow wherever and however they live (Holland, 2007). Haycock suggested districts use a common curriculum to keep students in the same program as they are affected by mobility (Holland, 2007).

Achievement gaps tend to become larger as time progresses and the students move through school (Alspaugh, 1996). Martin (2009) detailed the gap between students who are mathematically literate and those who are not, is connected largely to race and socioeconomic status. Heyneman (2005) described failing to close the achievement gap will lead to gaps in income and socioeconomic status as adults. Heyneman (2005) argued schools have more control over students narrowing the gap in subjects, such as mathematics where the school is in control of learning. Jeynes (2005) discussed another way to narrow the achievement gap was parental involvement.

In addition to differentiating the instruction, high stakes testing impacts economically and ethnically diverse students (Baker & Johnson, 2010; Nichols & Glass, 2006; Porter, 2009). Nichols and Glass (2006) described high stakes testing as a catalyst which helps to move education forward due to the accountability. If any transformation of the educational system is going to take place, high stakes testing will be at the center of the movement. Porter (2009) continued this thought calling for high stakes testing to be the accountability tool in measuring the achievement gap; however, a reformation of the testing system was suggested for tests to better match the way students learn and are taught. Baker and Johnston (2010) argued the testing system is flawed, and students in low socioeconomic situations continually score lower than high socioeconomic grouped peers, which could lead to schools losing accreditation and neighborhoods losing value because of a diminished school. Baker and Johnston (2010) suggested looking at factors causing the gap, mostly citing motivation, and attempting to fix the problem instead of throwing money at the problem blindly.

Berkas and Pattison (2006a, 2006b, 2006c, 2007a, 2007b, 2007c) described different passions teachers need to help overcome the achievement gap. The passion to learn was defined as not only student learning, but adults learning as well; learning what they need to help the students (Berkas & Pattison, 2006c). A belief is present that a passionate teacher can light the fire in the students, helping to close the gap (Berkas & Pattison, 2006c). Teachers must have a passion to teach significant mathematics, which means setting high expectations for all students and moving past rote memory as a means of teaching minorities and students of poverty (Berkas & Pattison, 2006b). The passion to lead was described as mathematics leaders stepping up and encouraging others to lead, as well (Berkas & Pattison, 2007a). Next, the passion to design data systems was detailed, encouraging teachers to use data to track student growth and achievement in mathematics in order to narrow the gaps. Finally (Berkas & Pattison, 2007c), the passion to achieve was described as the need of a constant vision to close the achievement gap across the nation.

Bracey (2006) discussed the risks of students in poverty, such as a mother-to-be not receiving proper prenatal care leading to low birth weights which have been connected to later cognitive issues. Bracey (2006) found only 36% of families in poverty have a friend who is a teacher, only 14% have a doctor as a friend; this can be compared to middle class families who reported having a teacher as a family friend 93% of the time and a doctor as a friend 70% of the time. Rothstein (2008) described the need to overcome the achievement gap as a combination of educational and social reformations. For the socioeconomic achievement gap to close, the socioeconomic gap needs to close. To help close the socioeconomic gap, Rothstein (2008) suggested improving pediatric and dental care, improving housing, and spreading the use of income-based housing, early childhood education, higher wages, and free after school programs to provide safe environments for students after school.

Learning and the Brain

Theoretical framework. Piaget (1950) was a psychologist in France during the early 1900s. Piaget (1950) commented on the importance of environment in the development of intellect; "The human being is immersed right from birth in a social environment which affects him just as much as his physical environment" (p. 171). According to Piaget (1950), the differences in environment can result in differences between students. People are dependent on each other for development of intelligence; therefore, a student who does not receive a stimulating environment in the early stages of development can be negatively impacted during the development of intelligence (Piaget, 1950).

Vygotsky (1993) was a psychologist who studied in the Soviet Union during the early 1900s. While most of Vygotsky's (1993) work laid the groundwork for schooling of students with special needs, his findings can also be applied to general population of students as well (Vygotsky, 1993). Vygotsky (1993) believed the tendencies students demonstrate are from their adaptation to environment to face various difficulties, which is also applicable for students of poverty. If the factors which caused the difficult situations and led to the negative character traits would have been stopped at the onset, those negative character traits could have been turned into positive traits (Vygotsky, 1993).

One of Vygotsky's (1993) suggestions for the transformation of the negative character traits was goal setting. Vygotsky (1993) believed if a student has a goal in mind, then the student can use goal setting and achievement to overcome the lack of deficiencies in life. Vygotsky (1993) believed a student who adapts to the educational process could learn to become accustomed to any social environment, which connects to Payne's (2007) theories on education as way of escaping poverty.

One of the most noted, early educational researchers was Dewey (1897, 1922, 1954). Dewey's (1897, 1922, 1954) work added to the study of students in poverty through his research of how students' personal experiences impact their learning. Dewey (1950) surmised, "From the standpoint of the student, the great waste in schools comes from his [the student's] inability to utilize the experiences he gets outside the school in any complete and free way within the school itself" (p. 46). Dewey (1950) commented, "The student shall have in his own personal and vital experience a varied background of contact and acquaintance with realities, [both] social and physical" (p. 69). Dewey (1930, 1950) discussed how a student needs to have more experiences and be able to use experiences in school to further the understanding of a topic.

School was described as a place which can modify social order and make a change in students' lives (Dewey, 1930, 1950). The school has to identify experiences for the students' broad social interactions and connect the interactions for a school learning experience (Dewey, 1909, 1930). Dewey (1909) used the example of swimming by explaining that a school can teach all of the movements, but without putting the students into water, it is unusable knowledge. Education is a child learning through experiences, starting from unconscious choices as an infant and growing through development (Dewey, 1897, 1930). The school is a place for students to learn to use previous experiences and share and learn with others; however, Dewey (1897, 1930) believed schools fall short in educating students due to the schools' inability to connect to life experiences and educate by supplying information.

Dewey (1930, 1954) explained experience as a way of learning. As the student needs to experience more to develop a deeper understanding, more guidance is needed to ensure the experiences as positive learning situations (Dewey, 1930, 1954). Dewey (1930, 1954) described the quality of experiences as an important aspect in the experiential learning; whereas, if meaningless low level experiences were allowed to continue, the understanding of future experiences could be impacted. Dewey (1930, 1954) argued education falls short in creating experiences for students. Often the teacher fails to take into account the purpose the students will bring to the experience and how the purpose will impact the experience (Dewey, 1930, 1954). Dewey (1930, 1954) depicted the largest challenge in education as not creating the experience but to make sure the students' experiences are connected to the subject matter as it is taught in the classroom.

Noting how a person's role in a group will change over the course of a lifetime, Dewey (1922, 1930) described that each individual is born as an immature part of the group, when an individual's time is passed the group will continue. Even though the span of an individual is small compared to the group itself, the older more mature members of the group must take on the education or instruction of the new immature individuals (Dewey, 1922, 1930). Schools are one of the methods to instruct these immature members of groups, and as Dewey (1922, 1930) believed, educational practices needed to be up-to-date and taught in the true context of learning for all new immature members of the group. Dewey (1922, 1930) detailed students who come from homes of highly educated adults as students who have their activities and experiences guided toward the education and the needs for learning. Dewey (1922, 1930) implied the responsibility of the school is to make sure there is good balance between experience and education to help each student escape the limits of social groups. With heredity and previous experiences to balance the learning process, students can learn and incorporate new experiences and previous experiences into the learning process (Dewey, 1922, 1930).

Glassman (2001) compared the work of Vygotsky and Dewey and found the two educational researchers to be similar in the views of life and play in the educational process. However, Glassman (2001) found Dewey believed experience was the vital part of learning for individuals, while Vygotsky viewed cultural and social goals as the fundamentals for learning. Glassman (2001) described Dewey's research as experience leading to culture, citing the role of education is to help students understand and connect their experiences. Glassman (2001) defined Vygotsky's research as culture leading to experience. Glassman (2001) concluded Dewey and Vygotsky were similar on the use of everyday activity in the classroom, but Dewey believed the everyday experience promoted individuality; while Vygotsky believed it helps the social structures remain in place. Glassman (2001) found Vygotsky's belief in the importance of the social group that small structures could define change; "Change of the larger social structure itself is historical and based on the cumulative effort of the social group over time" (p. 13).

The brain. Jensen (2006, 2009) is a leading researcher in understanding the brain and how it works. According to Jensen (2006), genetics do not account for all the variances in the brain; however, social, environment, and developmental factors have a large impact on how the brain performs. Stress and how the brain deals with stress also impacts the structure of the brain (Jensen, 2009). Jensen (2009) discussed the deficiencies exhibited by a student living in poverty in that, "40 percent of students living in chronic poverty had deficiencies in at least two areas of functioning by age 3" (p. 7). Jensen's (2009) study into how the brain works, for all students, and a more in-depth study of students living in poverty provided an understanding of how the brain is affected by poverty and how differences impact the education of the student who has grown up in poverty.

Jensen (2009) found students in poverty have low attendance due to a variety of problems. The students often have parents with a negative outlook on schools because of past experiences and are more likely to attend a school which is older and less maintained and staffed by less experienced teachers (Jensen, 2009). Jensen (2009) described stress incurred by many students in poverty due to frequent forced moves because of family situations. Jensen (2009) detailed the gap in achievement scores as a 29% gap on IQ scores between students on welfare and more affluent students. Jensen (2009) found 50-70% of a child's behavior can be connected to environment. Jensen (2009) categorized a student in poverty is going to face many challenges which will affect academic progress, such as "Emotional and Social Challenges, Acute and Chronic Stressors, Cognitive Lags, and Health and Safety Issues" (p. 14).

Piaget's (1950) work in the developmental stages of children and the way children learn is still studied. The first stage, symbolic and preconceptual thought, begins between the ages of one and a half and two and lasts until the child is about four years of age (Piaget, 1950). In the symbolic and preconceptual thought stage, a child starts to develop the knowledge of symbols at a very basic level (Piaget, 1950). The second stage is intuitive thought. This stage is most often present in children between the ages of four to seven and the child begins to make intuitive concepts concrete (Piaget, 1950). A child may be able to count out six objects to match six more objects on the table; however, if the objects on the table are different sized or spread out, the child may become confused (Piaget, 1950). The third stage is concrete operations; children are usually between the ages of seven to 12 (Piaget, 1950). In this stage, the children make connections between concrete operations and relating concrete operations to senses (Piaget, 1950). The final stage of development includes children from 12 years of age into adolescence (Piaget, 1950). In this stage, the formal ideas of intelligence mentioned in the previous stages are perfected, and children are also learning to reflect on personal learning and the learning processes (Piaget, 1950). Piaget's (1950) description of the stages of learning helps to identify areas where academic gaps exist for students who live in poverty.

The work of Gardner (1993) also provides insight into how all students learn and offers teachers insight and ideas into addressing the different ways which students learn. Since many students who live in poverty were not raised in an environment which supported the most constant learning styles of Linguistic and Logical-mathematical intelligence, teachers in a high poverty school use his research to better understand the way students learn (Gardner, 1993).

Willis and Johnson (2001) continued Gardner's work with Multiple Intelligences tying it to multiplication and describing strategies as centers or stations which can be used throughout the day. Students who have a logical-mathematical learning style already have the basic needs to be successful in multiplication; therefore, students should try different ways to solve problems through various operations (Willis & Johnson, 2001). Willis and Johnson (2001) suggested for students with a naturalistic intelligence to provide the students with connections to nature, such as using five fingers on each hand for groupings of five. Willis and Johnson (2001) recommended having the bodily-kinesthetic learners tap with fingers or use various shapes to count and group. For linguistic intelligence learners, Willis and Johnson (2001) believed students could listen to stories or even oral recitation of the facts. Willis and Johnson (2001) used visual models to help students with spatial intelligence and had students share strategies with one another for interpersonal intelligences. For intrapersonal intelligences, students should have a big problem goal and find strategies to solve these problems (Willis & Johnson, 2001). Willis and Johnson (2001) advised using patterns in music to have the students connect to patterns in multiplication. Willis and Johnson (2001) concluded if the teacher is able to teach the lesson in a way the student can connect to the learning intelligence; the student may realize higher engagement and achievement.

Math. The NCTM (2000) created a document identifying the principles and standards to help teachers have a better understanding in the instruction of mathematics. The NCTM (2000) is a combination of several earlier efforts, starting in the late 1980s to improve mathematics instruction with the goal to “set forth a comprehensive and coherent set of goals for mathematics for all students from prekindergarten through grade 12” (p. 6). The content standards are what the students should know: number and operations, algebra, geometry, measurement, and data analysis (NCTM, 2000). The NCTM (2000) identified number and operations as the content standard which is focused upon the most in the early grades, replaced by the algebra strand as the students progress through the grade levels. Geometry is fairly consistent through high school where it takes precedent over measurement and data and probability which are consistent through middle school and used very little in the high school grades (NCTM, 2000). Van De Walle (2001) and Harwell and Harper (2010) described how all of the content standards can be taught in various ways to meet the needs of all students. The strategies which demonstrate the most understanding from the students involve the use of manipulatives to give the students concrete learning experiences as the students learn new skills (Harwell & Harper, 2010; Van De Walle, 2001).

Piaget (1952) connected the developmental stages to understanding mathematics and science. The intuitive thought stage is described as absence of conservation where the size of the objects makes the connection for the students (Piaget, 1952). Concrete operations are described as intermediary reactions, in which students start to make observations more concrete (Piaget, 1952). The final stage, or formal operational stage, is described as necessary conservation in which students can make observations of objects and be able to describe the changes to the object (Piaget, 1952).

Parents can also contribute to the problem. Geist (2010) implied parents of low socioeconomic students often have a negative attitude toward mathematics due to a lacking educational background. Geist (2010) continued that negative parental influence can add to the achievement gap and cause students to have an anxiety toward mathematics. Geist (2010) cited research which detailed the highest risk factor for students is the family income in the home where the student lives. Geist (2010) concluded the current methods used in the schools today, of high stakes testing and timed tests, can lead to higher anxiety and a negative view of mathematics.

Many strategies have been developed to address the specific gaps in mathematics. Speilhagen (2006) observed in schools which have a high number of students who qualify for F/R that there are higher numbers of students who do not take Algebra I in eighth grade, which is a predictor of college success. Speilhagen (2006) commented districts which encourage more students to take Algebra I in eighth grade can help to close the achievement gap which can be created at this juncture in education. Ma (2001) detailed the effort to find if the achievement gaps are consistent across all subject matters first between schools, and then within schools based upon socioeconomic status. Ma (2001) found socioeconomic gaps in schools were consistent among mathematics and science and believed schools are successful in helping students with these gaps.

In addition to using strategies to close the gap, opportunities for learning need to be addressed, as well. Carter (2010) found the achievement gap can be addressed by looking at the situation as an opportunity gap; by equaling the opportunities for all students, experienced teachers and quality curriculum and resources, the gap can be reduced. Sheldon and Epstein (2005) detailed one way to narrow the achievement gap would be to give the students meaningful homework, in which the student will interact with the parents, and the supplies needed for the assignments will also be provided by school; this allows for parent interaction and involvement without the stresses of getting the supplies to complete the assignment. Felton (2010) contented that one of the reasons for the mathematics achievement gap is the different way students in poverty look at a problem. Students focus on context rather than the concept of the lesson (Felton, 2010). For example, when a teacher discussed fractions using a pizza-sharing event, students were distracted by getting to the restaurant late and not getting as many pieces of pizza (Felton, 2010). For the student in poverty, it was not about sharing equally, but taking care of self first, and because of this contextual thinking the students missed the concepts being taught in the lesson (Felton, 2010).

Lubienski (2001a) described the achievement gap in mathematics as higher socioeconomic students being trained to be leaders, while lower socioeconomic students are being trained to be followers. Lubienski (2001a) found many low socioeconomic students thought mathematics to be memorizing facts. Lubienski (2001a) detailed the teachers’ focus on the number and operation strand to be consistent among all socio-economic groups, while algebra received the least attention in fourth grade. Lubienski’s (2001a) research implied students across socioeconomic groups were very similar in use of manipulatives, real-life situations, and the amount of time students spent on homework; however, students were found to have a significant gap in problem solving ability. Lubienski's (2001b) and Lubienski and Shelly's (2003) continued research which detailed students living in low socioeconomic conditions have more rote learning and low-level mathematics practice. This can be influenced by low teacher expectations. Achievement gaps in fourth grade were fairly consistent across all of the five content strands in Lubienski's (2001b) research. Lubienski and Mack (2003) depicted mathematics achievement gaps as unable to be narrowed through curriculum or reform model mathematics strategies alone. Instead, the attempt to narrow the gap needs to be a student focused approach (Lubienski & Mack, 2003).

Young (1997) found the school's socio-economic status was a larger predictor of student success than individual socioeconomic status, and self concept played an important role in the student's success. Oakes (1990) described students of higher abilities who attend a school with a high amount of poverty and minorities will not have as many opportunities for learning mathematics as a student with low ability at an advantaged school. Oakes (1990) found schools with high poverty and high minority populations will not have as many learning activities with technologies or hands-on learning as peers in an advantaged school. Oakes (1990) concluded students living in poverty and who are minorities are not taught in the same way nor have the same experiences as students in advantaged schools.

A task force for the National Council of Supervisors of Mathematics (2006) described the achievement gap between students in the United States and students in other countries, as well as the achievement gap between students in the United States as the driving force in changing the way mathematics curriculum is viewed and taught. The USDOE National Mathematics Advisory Panel (2008) illustrated the need for American students to bridge the achievement gap so the United States could be economically competitive with the rest of the world. The panel portrayed college success as a way to help the United States remain competitive, and success in high school mathematics leads to success in college for all students (USDOE, 2008).

Another way the United States is attempting to narrow the gap at home and abroad is to have common standards for all students (National Governors Association [NGA], 2010). The findings of the National Mathematics Advisory Panel was the basis for the common standards to narrow the focus of mathematics as students progress through education tracks and were offered many experiential learning situations as possible (NGA, 2010). Craft (2010) argued the common standards would not necessarily help to close the achievement gap. Mirra (2004), working for the National Council of Teachers of Mathematics (NCTM), noted family involvements is essential for the success of all students in mathematics. With the help of all stakeholders school, community, and parents, an equal mathematics education for all is achievable (Mirra, 2003, 2004).

Strategies to close the achievement gap. Marzano, Pickering, and Pollock (2001) collected and analyzed research studies on student achievement interventions in the classroom. While the interventions were not necessarily aimed at students living in poverty, there was information which can be gleaned to help address the needs of low socioeconomic students (Marzano et al., 2001). Marzano’s work is important due to the extent of his research into effective teaching techniques to reach the needs of all students (Marzano, 2003; Marzano et al., 2001; Marzano, Waters, & McNulty, 2005). Marzano et al. (2001) commented on the Coleman report which found 90% of the influences on the student are outside the student's control, but the 10% that can be affected by schools should be the most productive instructional strategies to help the student. Marzano (2003) detailed socioeconomic status as one of the greatest influences on the success of students; however, home environment and the involvement of the family can help to minimize the impact of the socioeconomic influence.

Strategies for closing the socioeconomic achievement gap can be narrowed to district level, building level, and classroom level strategies. Zavadsky (2010) studied different districts that closed the achievement gaps and found the teachers and students knew exactly what was expected of them and what skills should be accomplished. The districts also recruited and retained high-quality teachers and kept them up-to-date with professional development training (Zavadsky, 2010). One district had fluid groupings, so students could be moved to a teacher who had strengths in the area the student was having a difficult time understanding (Zavadsky, 2010). Leader (2010) cited another successful district that involved parents and had teachers who were dedicated to closing the achievement gap with students who wanted to learn.

Some strategies are as easy to implement as increasing instructional time or playing games and could help to improve the achievement gap (Cavanagh, 2008; Walsh-Sarnecki, 2010); ideas, such as using a monetary school reward system which the students use to buy items at a schools store, narrowing the topics covered in mathematics, and having teachers meet often to discuss successes and failures in the classroom (Hammond, 2009; Martinez, 2010). The narrowed focus and lesson plan discussions allow teachers to try more successful hands-on learning which allows the students to have a deeper understanding of the topics discussed (Hammond, 2009). Van de Walle (2001) portrayed all teachers as being able to make an impact with high expectations, scaffolding instruction, focusing the class, helping students to extend their thinking, and having students acquire an in-depth knowledge of a subject. Teachers should assist students in understanding what is expected when taking a standardized test or differentiating instruction so all students are learning on their own level (Norton, 2007; Small, 2009). Truelove, Holaway-Johnson, Leslie, and Smith (2007) recommended several ways to increase student learning in the classroom: modeling, concrete representations, technology, real-life experiences, cooperative learning, classroom routines, and having students answer in a variety of ways.

Viadero and Johnston (2000) called for high-quality education for high poverty and minority students at the preschool level; although, while the system is in place, many of the programs do not have properly trained teachers. Chatterji (2005) found poverty had a highly negative impact on students' math achievement as the students progressed from kindergarten to first grade and called for early interventions for these students. Perez-Johnson and Maynard (2007) described early interventions as the best chance to reduce achievement gaps before students enter school. Perez-Johnson and Maynard (2007) identified the achievement gap for a student in poverty is easier to overcome the later a student's family went into poverty; however, they identified achievement gaps as early as one to two years of age. Perez-Johnson and Maynard (2007) concluded high-quality early interventions could pay off for all students involved without regard for socio-economic status, but it is most beneficial for students from poverty to be immersed into a highly-enriching environment earlier in life.

In the study of high-achieving schools, the schools making the biggest impact on the achievement gap had increased collaboration, used more innovative and adaptive instructional strategies, used real-world problem solving skills, and improved methods of assessment (Williams, 2003). Marzano et al. (2005) described one way to help narrow the achievement gap was a leadership team at the school with strong influence on what happens at the school. This shared leadership can lead to positive change for the students and help close the gap (Marzano et al., 2005). Williams (2003) concluded that schools with the ability to turn around students facing the underside of the achievement gap are schools that have highly-effective teachers with high expectations for the students. These teachers collaborate with each other and provide guidance and support, not only for the students, but for the community as well.

Increasing instructional time for students of poverty has been suggested by several researchers as an effective strategy. Waxman, Lee, and MacNeil (2008) reported administrators used tutoring, pull-out services, and teaching strategies to help close the achievement gap. However, before and after school tutoring was the most prevalent (Waxman et al., 2008). McGraw (2009) described a school closing the achievement gap by providing transportation for all students, a teacher created curriculum, and students who are not suspended because that would disrupt the learning process. The National Research Center on the Gifted and Talented [NRCG/T] (2006) recommended having as many minority teachers as possible so students see someone like them in school. Increasing the amount of time students spend in school by extending the school day and the school year was also suggested by the NRCG/T (2006).

Effective teachers work as teams, but in a very specific way. Schmoker (2006) commended teacher efforts in closing the achievement gaps, citing effective teachers are six times more likely to impact student achievement than less effective teachers. These effective teachers work as teams to align curriculum to state assessments and look at student work to develop and redesign lesson plans (Schmoker, 2006). Jensen (2009) discussed using data to help schools overcome the achievement gap. Jensen (2009) shared:

> The three most important steps to becoming a data-friendly school are (1) selling teachers on the value of data so that they can teach smarter, not harder; (2) creating a culture of continual data collection, analysis, and application; (3) emphasizing that using data to improve the teaching process is a sign of professionalism, not an acquiescence to failure. (p. 74)

Jensen (2009) believed only the data needed should be collected and ways to apply the data should be put into place. Jensen (2009) concluded teachers should be held accountable for standards put into place by national, state, and local agencies to improve teacher focus and improve student achievement.

Hanna (2009) detailed a school which used parent-only meetings to teach the parents how to help the students. Shih (2010) described a school which used many of the businesses in the town to help meet the needs of the students by providing internships, cooperative projects, and giving real-life experiences the students could apply to learning. Protheroe (2010) found family support to be a beneficial tool to close the achievement gap. His research found parental involvement needs to be more complicated than just a parent going on a field trip or working a class party (Protheroe, 2010). Instead, it should be supportive to the educational process with a mathematical and literacy base supported by teachers helping parents gain the tools they need to help the students succeed (Protheroe, 2010).

Strategies for closing the achievement gap by reducing class size, having high expectations and a common focus, more time dedicated to mathematics, and increasing the amount of time spent in school were detailed by NWEA (2006). Beecher and Sweeny (2008) documented a school which had closed the achievement gap by developing a long range plan. Then, the school implemented the action steps to accomplish this plan (Beecher & Sweeny, 2008). O'Doherty and Ovando (2009) discussed for long range change to take place; the change must start at the school and extend to the district level.

The strategies of effective math teachers were identified by Protheroe, Shellard, and Turner (2004): "acceptance of students' divergent ideas, teacher questioning, teacher attitudes, being actively engaged in doing mathematics, solving challenging problems, using interdisciplinary connections and examples, providing opportunities for group work, allowing opportunities for student communication, manipulatives, and using calculators and technology" (pp. 37-41). Ideas to improve students' attitudes toward mathematics, by using things like events from the students' lives to create word problems for the students to solve were suggested by Protheroe et al. (2004). Santamaria (2009) identified the various gaps found in schools today and described one of the strategies to close these gaps as differentiated instruction, where students are taught on a personal level. Rebora (2008), in an interview with a differentiated instruction expert, found many schools are separating the learners based on ability groupings, which often falls along ethnic and socioeconomic boundaries. Instead, it is suggested to teach all students on level in the classroom (Rebora, 2008).

For a school to change, the school will need highly motivated teachers with high expectations and focus for student learning; a school which promotes collegiality and provides a safe, nurturing environment for the students to learn (NRCG/T, 2006). Strategies to decrease the achievement gap include district-wide strategies, such as increasing instructional time (NRCG/T, 2006). At the building level, giving teachers time to collaborate to develop successful lessons together has been noted as an effective strategy (NRCG/T, 2006). In the classroom, the teacher having high expectations for the students was noted as a strategy which impacted the achievement gap (NRCG/T, 2006).

Summary

The data derived from national, state, and local tests have demonstrated minority and socioeconomic achievement gaps. The use of government funds to help overcome socioeconomic achievement gaps demonstrates the national concern for preventing a further separation of the socioeconomic classes (Johnson, 1964; USDOE, 2009a).The work of current researchers, as well as the noted theorists, has led to a greater understanding of how each student learns differently and provides a viable framework to study students of poverty. On the national level, the NAEP scores, which had shown steady increase over the past two decades, had no significant increase in 2009 (NCES, 2009a, 2009b, 2009c, 2009d; Tomsho, 2009). On the state level, a recent study found Missouri to have some of the highest proficiency standards in the nation (MODESE Public Information, 2009). A NCES (2007a) report comparing state test results to the

NAEP found 37% of students in Missouri were proficient on the MAP and the NAEP in 2003.

Title I was created by President Johnson's ESEA of 1965, which provided funding to address the differences students faced in the classroom (Walker & Mohammed, 2008). With the passing of NCLB, independent agencies were put into place to track Title I successes and areas of improvement (NCEE, 2007; USDOE, 2009b). These agencies tracked how the money was dispersed by the national agency and the success of the schools which received funding (NCEE, 2007; USDOE, 2009b). The agencies tracked data on tests and the teacher quality in the schools which received funding (NCEE, 2007; USDOE, 2009b).

Poverty is a growing problem at all levels in the country. Szabo (2010) and Yen (2010) found over 20% of children would be identified as living in poverty on the 2010 United States Census. Payne (2007) found the United States has a poverty rate about three times as high as any other western industrialized nation, and children living in single parent households are much more likely to live in poverty. The Secretary of Education has called for educational reforms to help solve the civil rights situation of the American education system ("Civil Rights Leaders," 2010; Williams, 2010). Missouri found the achievement gaps to be largely in the urban centers of the state (MDHE, 2001).

Students in poverty face many challenges (Ellis, 2004; Payne, 2002). Payne (2002) described the brain as being 50% formed by genetics, and the other 50% formed by environment; students in poverty lack many different types of experiences and will need to be taught in a way which respects what knowledge the students have while trying to address what knowledge the students lack. Ellis (2004) detailed students living in poverty as lacking an internal clock, so they are unable to set deadlines and give adequate time to complete the assignment because of the flux of the poverty lifestyle. Benson and Borman (2007), Long (2008), Mathews (2010), Swanson (2007), Toppo (2010), and Von Drehle (2010) documented summer learning loss which can impact a student in poverty; the researchers found students maintain or improve upon the achievement gap during the school year, but it will increase over the summer as much as three grades by the time the students will enter high school. Eisler and Weise (2009), Jalonick (2010), and Lubrano (2010) called on the nation to increase the amount of funding spent on feeding students during the summer since, during the school year; over 20 million students receive free or reduced breakfast and lunches. When school is out, the meals are more difficult for the students to find (Eisler & Weise, 2009; Jalonick, 2010; Lubrano, 2010). McCrummen and Birnbaum (2010), Harris and Herington (2006), Rotherham (2010), and Schrader (2009) each suggested trying to integrate students from high poverty schools with students from low poverty schools. Instead of having two extremes, have schools where students are in the middle. The researchers found high poverty students in a school with a lower percentage of students in poverty will perform better than high poverty students in a high poverty school (Harris & Herington, 2006; McCrummen & Birnbaum, 2010; Rotherham, 2010; Schrader, 2009).

Dewey (1897, 1922, 1954), Piaget (1950), and Vygotsky (1993) provided the theoretical background for this study. Dewey (1897, 1922, 1954) contributed the use of experience in learning. Vygotsky (1993) viewed social learning structures to guide learning. Piaget (1950) described the stages each child will progress through as the child develops. Jensen (2009, 2010) identified how the brain is impacted during learning and how the brain of a child in poverty develops and needs attention differently than a middle class peer.

Piaget (1952) further expressed how the students' stages of development will impact learning in mathematics. Felton (2010) contended one of the reasons for an achievement gap is the way the students in poverty look at problems differently. Lubienski (2001a, 2001b) found students in a high poverty school were more likely to be taught mathematics as rote memory, while low poverty schools focused on the problem-solving aspects of mathematics. Marzano et al. (2001), Marzano (2003), Williams (2003) Marzano et al. (2005), Schmoker (2006), and Jensen (2009) identified different strategies to help close the achievement gap by having teachers who collaborate often with high expectations for students who can become motivated and employing parental support at home or parents who are willing to be trained by the teachers to help their child.

Within the review of literature and research related to the problem the conceptual frameworks provided by Payne and Jensen, as well as the current issues for students in poverty were presented. In Chapter Three, the methodology and procedures used to gather data for the study were detailed. The results of analyses and findings to emerge from the study were contained in Chapter Four. In Chapter Five, a summary of the study and findings, conclusions drawn from the findings, a discussion, and recommendations for further study were presented.

Chapter Three: Methodology

The research questions in this study were designed to provide a better understanding of the achievement gap based on poverty. Secretary of Education, Arne Duncan, described the current state of education in the United States as a civil-rights issue (“Civil Rights Leader, 2010; Williams, 2010). Duncan has called for the United States educational system to provide a world-class education for all students (Connelly, 2010), as the poverty rate in the United States is growing to nearly 20% of all students in 2010 (Szabo, 2010; Yen, 2010). Payne (2007) found the poverty rate in the United States is two to three times larger than other western industrialized nation. Klein (2009) suggested if the United States would provide an education to help students remove themselves from poverty; the result would be a more secure national economy.

An increasing number of high poverty schools (Khadaroo, 2010) has generated a need to provide appropriate learning experiences for students of poverty to narrow the achievement gap. The purpose of this study was to identify the achievement gaps within the five content strands of mathematics. The disparities in mathematics between students in high poverty schools and students in low poverty schools were examined by comparing differences on standardized test scores. The study is a mixed method design using both qualitative and quantitative data. The qualitative data are the human perspective, provided through interviews from current elementary principals (Trochim, 2006e). The quantitative data are the student test scores, used to compare schools with high and low percentages of students who qualify for F/R (Trochim, 2006e).

Included in this chapter, the research questions and hypotheses were restated. The population and sample size for the study were discussed. Because the study reviewed data from over a five year period, a large number of students were studied. In the instrumentation section, the MAP, Performance Series, and STAR Math test which was used to measure the knowledge of the students in the sample, and the interview questions which were used to gain input from the leaders in the buildings of these students, were detailed. The data collection included obtaining the students' test data and establishing the location and time period for the interviews. The design of the study was described and the statistical tools used in the study to compare and analyze the data were identified. In the data analysis section a discussion included how the data were organized and analyzed once collected and the application of the statistical tools used in each step of the process. Finally, the ethical considerations were given to understand the process used to protect the identity of the district, schools, leaders, and students in the study.

Research Questions

The following research questions guided the study:

1. What difference exists in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

2. What difference exists in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

3. What difference of student scores exists within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

4. What difference of student scores exists within the five mathematical strands

on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

5. How do building level principals perceive the mathematical academic performance of students from high and low socioeconomic status?

Null Hypotheses (H_0)

1. There is no significant difference in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

2. There is no significant difference in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

3. There is no significant difference of student scores within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

4. There is no significant difference of student scores within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

Alternative Hypotheses (H_1)

1. There is a significant difference in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

2. There is a significant difference in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

3. There is a significant difference of student scores within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

4. There is a significant difference of student scores within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

Population

The population for the study was taken from one urban Missouri public school district which has been an organized school district since 1867 and currently is the largest fully-accredited school district in the state (Local School Directory, 2010). Within this school system are 36 elementary schools and a fifth and sixth grade center (Local School Directory, 2010). Historically, the city, which has a population of over 150,000, has distinct socioeconomic areas: the north and south sides (Horton, 2010). The north side of the city is the older of the two areas of the city, where property values have dropped and many of the old houses have been removed and replaced by less expensive multi-family dwellings (Horton, 2010). The south side of the city has less industry and more new home construction (Horton, 2010).

In the district, 44.7% of the students qualify for F/R (Local School Directory, 2010). The wide range of socioeconomic status is exemplified by two elementary schools, Non-Title School 1 (NTS-1), which is the furthest south in the district and has a F/R rate of 15% (Horton, 2010), and Title School 1 (TS-1), located in the northern region of the district and has a F/R population of 95% (Horton, 2010) as shown in Table 1 a list of schools in the district which is sorted by the percentage of students who qualify for F/R was provided to further highlight the wide range of socioeconomic level within the district boundaries.

Table 1

List of Schools by F/R Percentage.

School Code	Total Students	Free Meals	Reduced Meals	Percentage of F/R
TS - 1	284.00	249.00	21.00	95.1%
TS - 2	195.00	169.00	14.00	93.8%
TS - 3	296.47	253.47	20.00	92.2%
TS - 4	256.20	211.00	24.20	91.8%
TS - 5	208.00	173.00	15.00	90.4%
TS - 6	297.00	245.00	22.00	89.9%
TS - 7	283.00	226.00	28.00	89.8%
TS - 8	243.20	197.20	17.00	88.1%
TS - 9	380.37	293.37	33.00	85.8%
TS - 10	263.00	192.00	28.00	83.7%
TS - 11	252.00	175.00	27.00	80.2%
TS - 12	283.23	196.00	28.00	79.1%
TS - 13	222.00	155.00	20.00	78.8%
TS - 14	180.31	113.31	27.00	77.8%
TS - 15	381.00	246.00	45.00	76.4%
TS - 16	219.00	132.00	24.00	71.2%
TS - 17	218.60	124.00	16.00	64.0%
TS - 18	261.50	135.50	30.00	63.3%
TS - 19	294.20	145.00	37.20	61.9%
TS - 20	204.40	107.00	16.00	60.2%
TS - 21	419.50	194.00	40.00	55.8%
NTS - 16	478.00	213.00	43.00	53.6%
NTS - 15	260.20	121.00	16.00	52.7%
NTS - 14	305.00	131.00	23.00	50.5%
NTS - 13	141.70	60.50	10.00	49.8%
NTS - 12	319.52	112.52	32.00	45.2%
NTS - 11	392.40	120.00	40.00	40.8%
NTS - 10	269.89	79.53	26.00	39.1%
NTS - 9	285.00	78.00	23.00	35.4%
NTS - 8	335.60	82.00	19.00	30.1%
NTS - 7	509.24	95.00	33.00	25.1%
NTS - 6	307.40	61.20	14.00	24.5%
NTS - 5	397.50	75.00	18.00	23.4%
NTS - 4	369.00	71.00	14.00	23.0%
NTS - 3	488.20	60.00	29.00	18.2%
NTS - 2	493.40	55.00	29.00	17.0%
NTS - 1	511.64	57.64	20.00	15.2%

Note. Schools in shaded cells are included in the study.

Sample

Between 3,000 and 4,000 students' test scores in MAP, STAR Math, and Performance Series were used for each year of the study. The students included were determined by F/R percentages. Schools with less than 25% or greater than 75% of the student population qualifying for F/R were included in the study. Students participating in this study had taken the MAP, the Performance Series, and/or the STAR Math.

Of the 37 elementary principals in the district, 12 were chosen by a stratified random sampling procedure to participate in face-to-face interviews (Driscoll & Brizee, 2010; Trochim, 2006c). The schools were ranked based on F/R population percentage. Next, six of the 10 principals from schools with the highest percentage of students receiving F/R and six of the 10 principals from schools with the lowest percentage of students receiving F/R were used as the sample for the face-to-face interviews, which served as qualitative data (Driscoll & Brizee, 2010).

Instrumentation

The data collection instruments used in the study were the three testing systems: the STAR Math, Performance Series, and the MAP. The test data had been collected and stored in a computerized data warehouse by the district. Following permission by the district to access the data, various file sets were obtained. The data were then generated into reports based on school, grade, socioeconomic factors, and test scores by the warehouse user. The assessments were field-tested by several student groups prior to use to provide both reliability and validity for any student who takes the test (MODESE Public Information, 2009; Scantron, 2008, Renaissance Learning, 2009).

Interview questions were developed for face-to-face interviews scheduled with principals from both high and low quartiles of the socioeconomic spectrum. The questions were framed to garner the perceptions of the principals surrounding the mathematical achievement of students from various socioeconomic levels. The interview questions were field-tested by providing principals who were not part of the stratified sample, to assure clarity and understanding, to reduce bias, and ensure questions were not confusing. The field testing yielded no changes; the principals reported the questions were easy to understand and believed no bias was included in the questions. The responses from the interviews were confidential; a coding system was designed to assure the individual responses to the interview questions were anonymous. Driscoll and Brizee (2010) warned the responses to the interview questions should not be taken out of context; to guard against this, each of the interviews was conducted by the researcher and audio recorded for accuracy.

Data Collection

Data were collected at various times; the interviews were conducted in October and student score data were requested in November. The district in which the student data were collected requires a request to conduct research. Once approval was received from the university and the district in late October, data in the form of students' scores were requested via email (see Appendices A, B, and C). A conference was held with the district's quality improvement and accountability department to identify the records needed for the study and how the data would be gathered. The data were collected from the following time periods: STAR Math 2006-2009, Performance Series 2009-2010, and MAP 2006-2010. The data were aggregated by test; into years, and each year was divided by schools. Data time spans are short due to licensing windows for the testing products and appropriate grade level tests.

Prior to the interviews, principals were contacted via letter requesting an interview and scheduled at the interviewees' conveniences (see Appendices D and E). Interviews were conducted on site with each of the 12 principals. Each interview took between five and 15 minutes depending on how prepared the interviewees were to answer the questions supplied in the request for an interview. The responses from the interviews were audio recorded with the consent of the participant; the recorded interviews were then transcribed for accuracy.

Design of the Study

Two tests were used to create inferential statistics. The Pearson *r* was applied to analyze and compare the student test scores in schools with a F/R of greater than 75% and less than 25%. The closer the number is to +1.00, the stronger the correlation (Trochim, 2006a). The *t*-test was used to compare the student's test scores for significance. The alpha level for significance was set at $p < \alpha$ .05 (Trochim, 2006d). Additional descriptive statistics were used to further support the research questions. Interviews were used as a qualitative method to study the perceptions and beliefs of principals who lead a school with a F/R percentage above 75%, and a F/R percentage below 25%. The subjects of the interviews were identified through stratified random sampling, which ensured a sample of the total population was diverse as to not negatively impact the outcome of the study. The whole group was divided into subgroups and random samples were taken from the subgroups (Trochim, 2006c). Finally, statistical landmarks were used to provide background for the data such as mean, maximum, minimum, and standard deviation (Trochim, 2006b).

Data Analysis

The data were entered into a Microsoft Office Excel spreadsheet and a *t*-test was used to study the differences between the student scores within the two F/R quartiles (Trochim, 2006a). The scores were aggregated by test, year, and then schools to identify schools within each quartile. The data were studied based on a year-to-year basis, providing different testing windows which were studied. The MAP and Performance Series test data were examined by dividing the data into the five mathematical strands to identify discrepancies. Discrepancies were the identifier for the achievement gap. Student scores were grouped into schools with a F/R student population below 25% and above 75%. Next, the Pearson *r* and *t*-test were applied to each of the tests to determine correlation and significance (Trochim, 2006a, 2006d). The five strands were separated based on high and low quartiles, and student scores were ranked high to low to allow for trends in statistical landmarks: the mean, the range, and the standard deviation. A written description of the data findings was then articulated.

Ethical Considerations

For the study, safeguards were in place so student scores were kept confidential. Also, the schools studied were identified using a coding system. Each principal was assigned a pseudonym to respect confidentiality, and a data code was established to provide anonymity (Driscoll & Brizee, 2010). Permission was given by the school district for test data to be used in this study.

Summary

Student test data were collected and placed into a spreadsheet which was used as a tool to sort the data for analysis. The spreadsheet software allowed for graphs and tables to be created to demonstrate the statistical landmarks. The landmark differences between the groups were used to identify the gaps between the student performances. Student test data are from reliable and valid sources as demonstrated through the testing companies' research and analysis (MODESE Public Information, 2009; Renaissance Learning 2009; Scantron, 2008). The interviews provided a human perspective to the data and were used to compare and contrast with the statistical data.

In Chapter Three, the methodology and procedures used to gather data for the study were detailed. The results of analyses and findings to emerge from the study were contained in Chapter Four. In Chapter Five, a summary of the study, and findings, conclusions drawn from the findings, a discussion, and recommendations for further study were presented.

Chapter Four: Analysis of Data

In 1965, President Lyndon B. Johnson delivered the Great Society Speech, most noted as the War on Poverty. This speech brought to the forefront a nationwide awareness and attempt to overcome achievement gaps. More recently, Bracey (2002) argued that in the United States two very different school systems are in place: one for the poor and minority students and the other for the rest of the population. The difference in the educational systems based on students' socioeconomic status was a matter of national concern for years (Bracey, 2002; Johnson, 1964).

The purpose of this study was to examine the difference between student scores in a school with greater than 75% of students receiving F/R and student scores in a school with less than 25% of students receiving F/R. Comparisons were made in student growth in mathematics, using the STAR Math and Performance Series, of elementary students in a large Midwestern school district. Also, the mathematical strands and achievement levels of the students were examined to identify the specific achievement gaps between students of high and low socioeconomic status as determined by the Performance Series and MAP tests. Additionally, face-to-face interviews with building level principals were conducted to gather the perceptions of student achievement based on socioeconomic status.

Chapter Four included a review of the sample and demographic data. Next, the research questions were presented. The quantitative research questions were provided with each question being supported by a *t*-test, Pearson *r*, and statistical landmarks for the supporting data. Graphs were also used to represent the numerical data in a compact and easy to understand form. The fifth research question, a qualitative question based on principals' perceptions, was the last section of the chapter. Summaries of the principals' responses to each question were detailed.

Sample

No surveys were used in this study; however, interviews of elementary building principals were conducted. The interviews were based on stratified sampling; the 37 elementary principals in the district studied were divided by building F/R rate, the principals with the 10 lowest percentages of F/R students and with the 10 highest percentages of F/R students were identified. From the two groups of 10 principals, six from each group were randomly chosen to participate in the interview. All 12 agreed to be interviewed, and interviews were conducted at the school of the principal.

Demographic Data

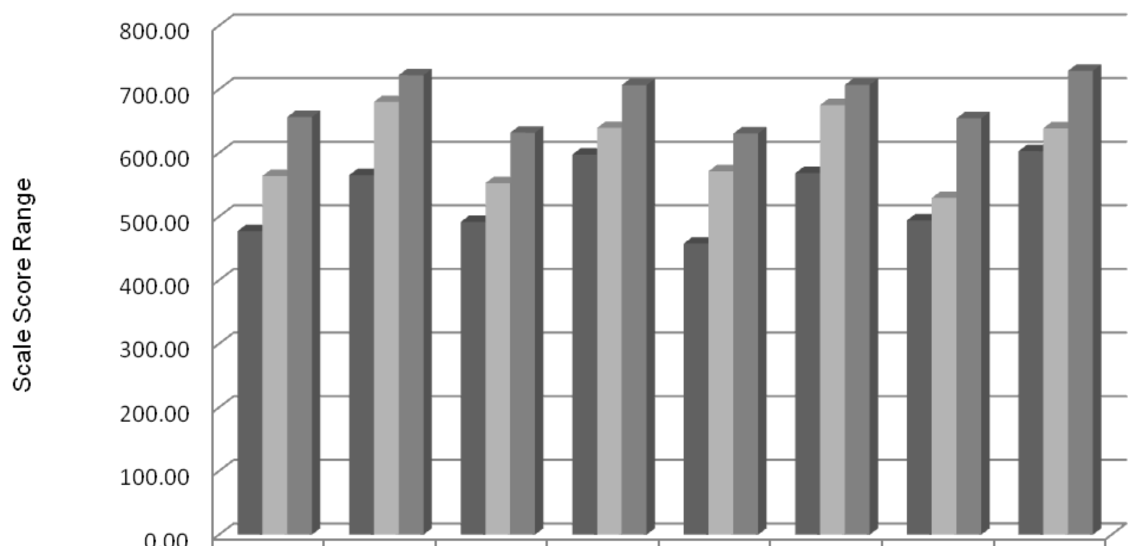
Of the 12 participants in the interview, six of the principals were at Title I schools. Seven of the principals administered K-5 sites, three of the principals served K-4 sites, one was principal of a 5-6 building, while the last was the principal of a K-8 building. Half of the participants were male, and the other half female. The years of experience for the interview subjects ranged from a first year principal to a principal in the 14th year of administration.

The student test data covered a five-year span (2005-2010). The STAR Math test was given from 2005-2009, the Performance Series Math test was given from 2008-2010, and the MAP Mathematics was given from 2005-2010. Grades three, four, and five were included in the study. Due to different school configurations, two of the schools concluded with the third and fourth grade, while another had only fifth grade. From each of these years and each of these test groups, between 3500 and 4000 students were included in the data. These students came from schools which had a F/R population greater than 75% or a F/R population less than 25%.

Research Question One

What difference exists in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%? The student scores from the 22 schools in the study on the STAR Math were analyzed and a *t*-test was conducted to look for significance. The alpha level for significance was set at $p < \alpha$ .05 (Trochim, 2006d). A Pearson *r* was used to test for correlation. The closer the number is to +1.00, the stronger the correlation (Trochim, 2006a). The STAR Math test was used in academic years 2005-2009. However, 2008-2009 was a year in which the district was transitioning between the STAR Math test and Performance Series test. Not every school participated in the STAR Math test during the academic year, only 439 student files existed for the 2008-2009 academic year, compared to 3,000-4,000 in other years. The 2008-2009 year data were documented; however, it was not as rich for support as previous years studied. A summary of each of the schools was followed by a figure representing average scores for each grade level during beginning of the year (BOY) and end of the year (EOY) test windows.

Title School-1. TS-1 had between 120 and 130 students who took the Star Math test during academic years 2005-2008, and 100 who took the test during the 2008-2009 academic year. The summer learning gap is evident by looking at the EOY scores for third grade, then comparing those scores to BOY fourth grade. The summer loss of retention was seen between fourth and fifth grade. The classes which are able to be tracked for the entire time demonstrate consistent growth. The first third grade class (2005-2006) to have data for all three years grew 229.88 points over the three year period 2005-2008. The second third grade class (2006-2007) grew 237.75 points. The averages for the BOY and EOY testing windows are displayed in Figure 1.

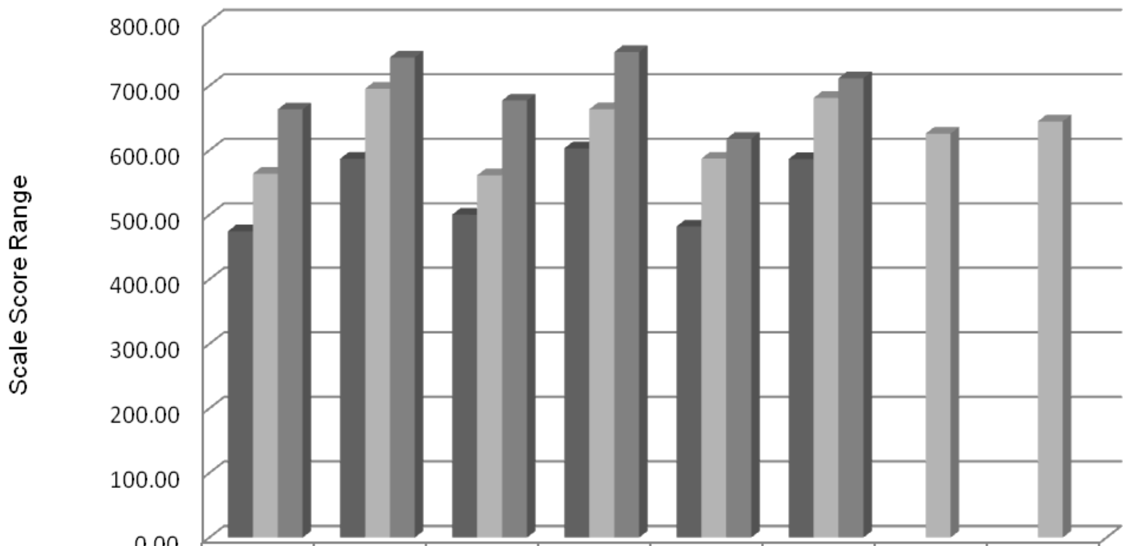


	2005 - 2006		2006 - 2007		2007 - 2008		2008 - 2009	
	BOY	EOY	BOY	EOY	BOY	EOY	BOY	EOY
Third Grade	477.25	565.11	491.53	597.42	457.76	568.43	494.09	602.85
Fourth Grade	563.85	680.26	552.64	639.4	571.34	675.4	529.32	638.84
Fifth Grade	656.42	722.27	631.88	706.8	630.63	707.13	654.53	729.28

Average Scale Score on Star Math Test by Grade Level

Figure 1. STAR Math BOY and EOY scores for Title School -1.

Title School-2. TS-2 had between 80 and 95 students who took the Star Math test during academic years 2005-2008 and one who took the test during the 2008-2009 academic year. As in TS-1 the summer retention drop was evident by comparing EOY scores for one grade, with the BOY scores for the next. The one third grade class which was examined for the three year span of 2005-2008 grew 237.01 points. The averages for the BOY and EOY testing windows are displayed in Figure 2.

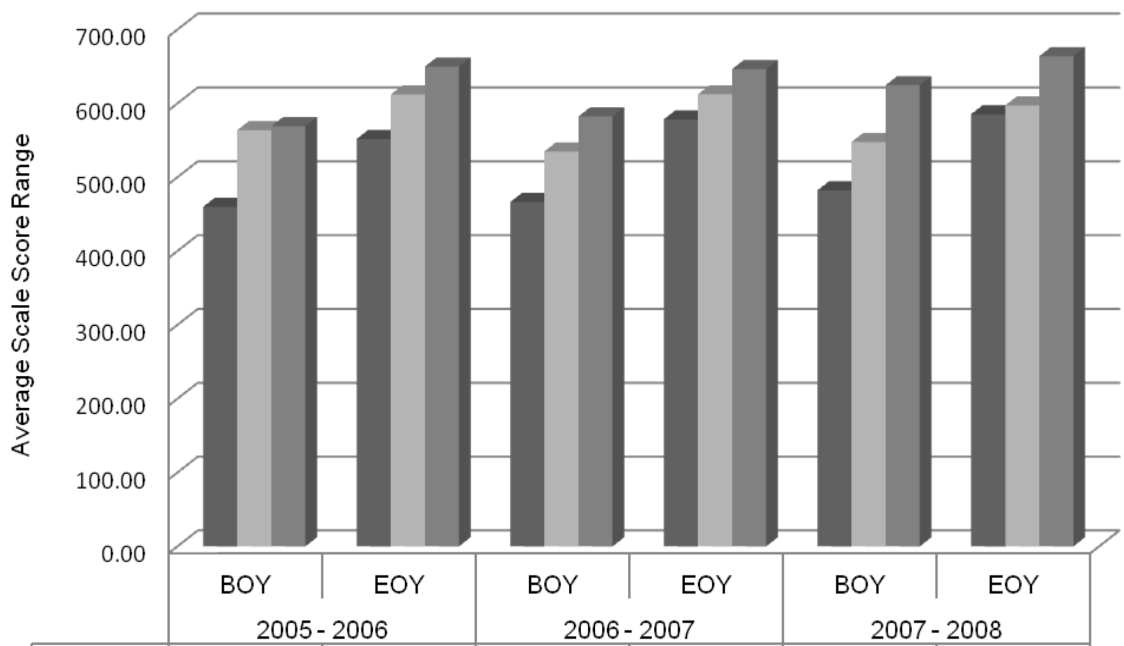


	BOY	EOY	BOY	EOY	BOY	EOY	BOY	EOY
	2005 - 2006		2006 - 2007		2007 - 2008		2008 - 2009	
Third Grade	474.76	587	500.53	603.22	482.07	586.72		
Fourth grade	563.88	695.48	561.4	663.76	587.33	681.24	626	645
Fifth Grade	663.61	744.11	677.38	752.42	617.96	711.77		

Average Scale Score on Star Math Test by Grade Level

Figure 2. STAR Math BOY and EOY scores for Title School -2.

Title School-3. TS-3 had between 90 and 130 students who took the Star Math test during academic years 2005-2008 and none took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The exception to this was the 2006-2007 fourth grade class to 2007-2008 fifth grade class which increased 24.42 points. The one third grade class which was tracked from 2005-2008 demonstrated 204.18 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 3.

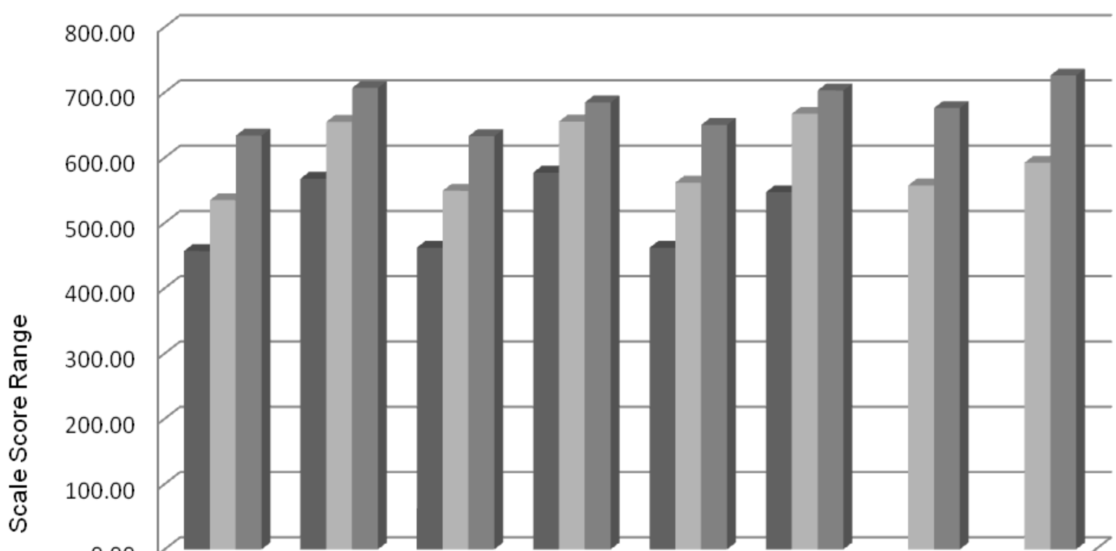


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY
3rd grade	459.79	551.81	466.37	578.37	482.23	585.26
4th grade	563.63	612	534.92	612.39	547.78	597.24
5th grade	569.1	649.95	582.36	646.52	624.81	663.97

Average Scale Score on Star Math Test by Grade Level

Figure 3. STAR Math BOY and EOY scores for Title School-3.

Title School-4. TS-4 had between 125 and 140 students who took the Star Math test during academic years 2005-2008, and seven who took the test during the 2008-2009 academic year. During the 2008-2009 testing window only seven students from this school have recorded scores, which were acknowledged in the graph, but does not provide adequate data for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 245.94 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 4.

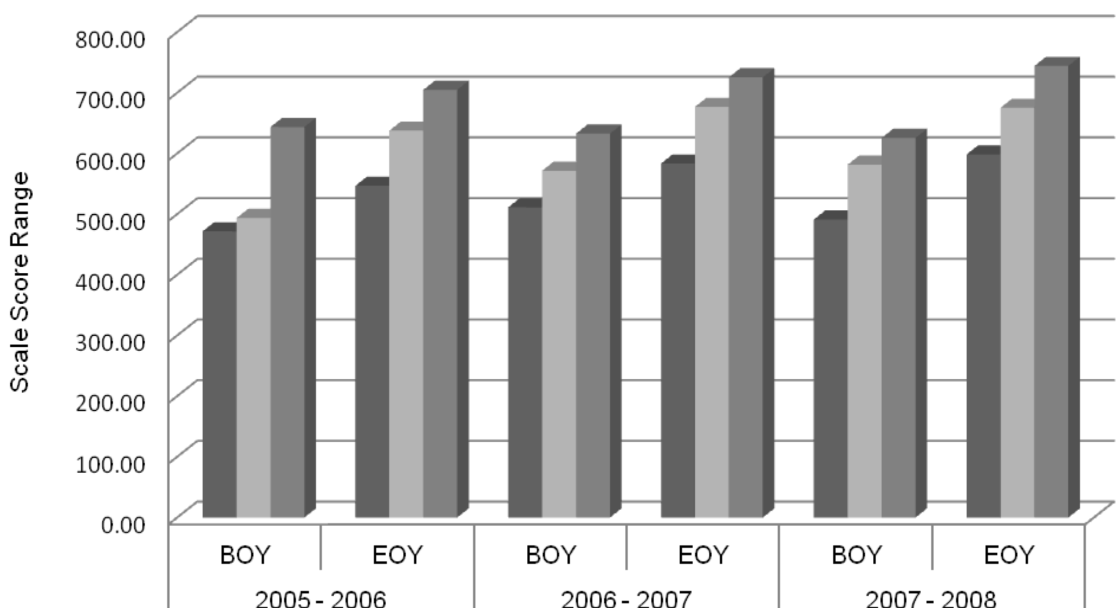


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	457.06	567.78	462.15	577.08	461.91	547.09		
4th grade	534.88	654.8	549.29	655.44	561.83	667.2	557.5	592.25
5th grade	633.78	706.81	632.88	684.58	650.32	703.00	676	726

Average Scale Score on Star Math Test by Grade Level

Figure 4. STAR Math BOY and EOY scores for Title School-4.

Title School-5. TS-5 had between 70 and 90 students who took the Star Math test during academic years 2005-2008 and none who took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The exception to this trend is the third grade class from 2005-2006 to the fourth grade class of 2006-2007 which had 24.76 points of growth between the EOY test for third grade and BOY test for fourth grade. The one third grade class which was tracked from 2005-2008 demonstrated 272.63 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 5.

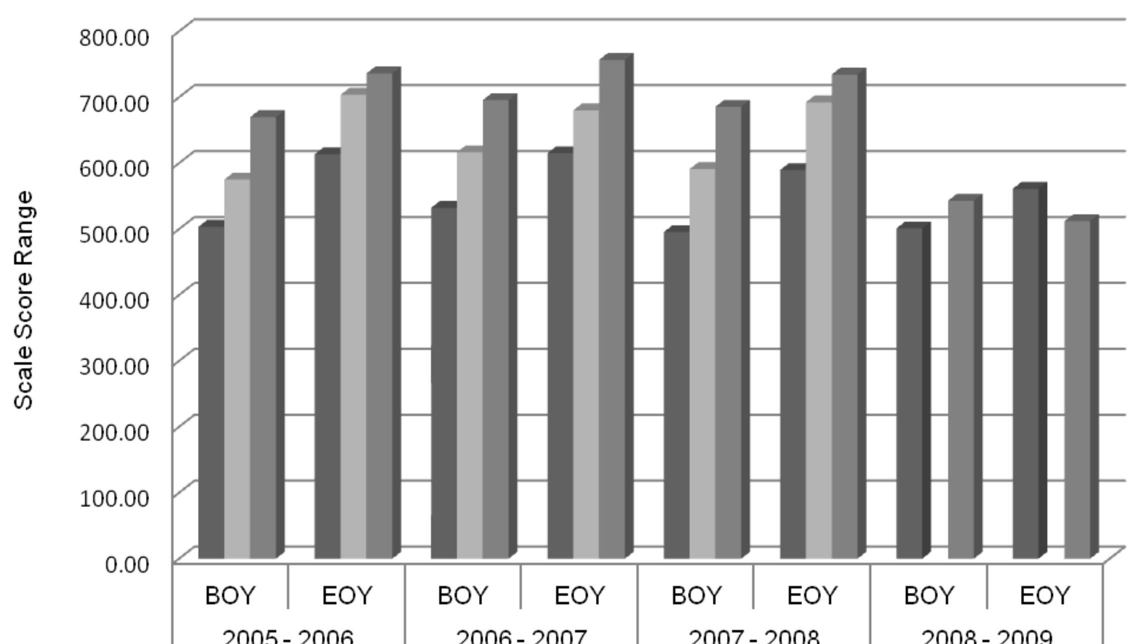


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY
3rd grade	471.59	546.72	511.16	583.28	491	598.28
4th grade	493.56	637.64	571.48	676.74	581.59	675.19
5th grade	643.61	704.81	632.67	725.5	625.57	744.22

Average Scale Score on Star Math Test by Grade Level

Figure 5. STAR Math BOY and EOY scores for Title School-5.

Title School-6. TS-6 had between 75 and 135 students who took the Star Math test during academic years 2005-2008, and three who took the test during the 2008-2009 academic year. Due to the lack of student records for the 2008-2009 testing window the scores were acknowledged in the graph, but not for comparison purposes. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The third grade class of 2005-2006, which became the fourth grade class of 2006-2007 did not follow the trend of summer loss, the class increased six points one summer and five points the next. The one third grade class which was tracked from 2005-2008 demonstrated 230.98 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 6.

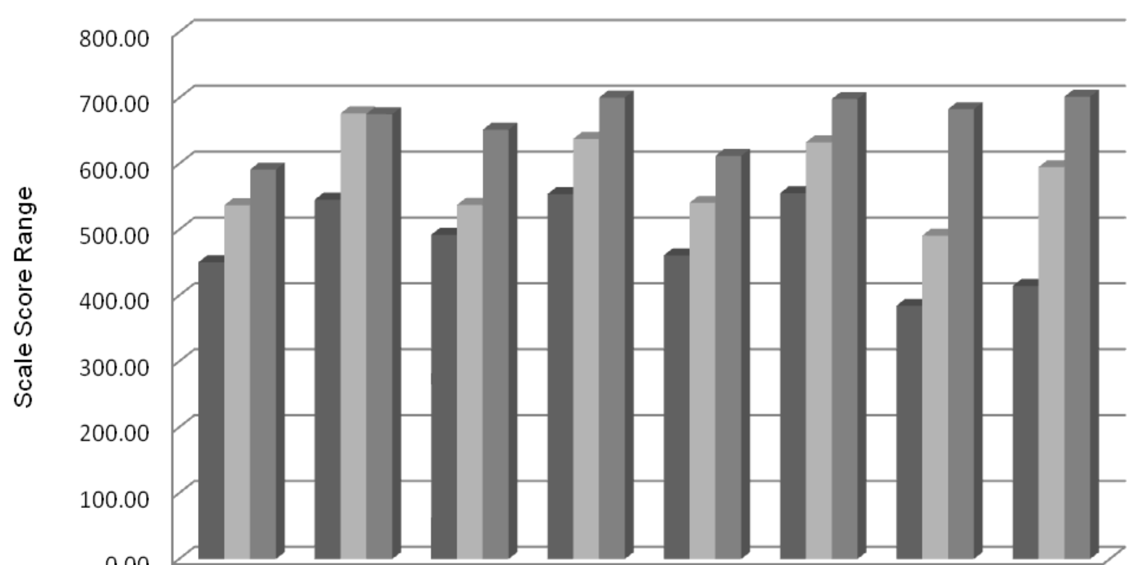


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	503.52	613.64	532.17	615.07	495.41	589.56	501.00	561.00
4th grade	575.12	703.73	616.43	680.13	591	692.28		
5th grade	669.86	736.17	695.73	756.77	685.53	734.50	543	512

Average Scale Score on the Star Math Test by Grade Level

Figure 6. STAR Math BOY and EOY scores for Title School-6

Title School-7. TS-7 had between 95 and 105 students who took the Star Math test during academic years 2005-2008 and four who took the test during the 2008-2009 academic year. Once again, the 2008-2009 testing window lacks sufficient data for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 247.78 points of growth. A bright point for the fourth grade or an area for improvement in the fifth grade was in 2005-2006 when the fourth grade outperformed the fifth grade by 1.2 points during the EOY test. The averages for the BOY and EOY testing windows are displayed in Figure 7.

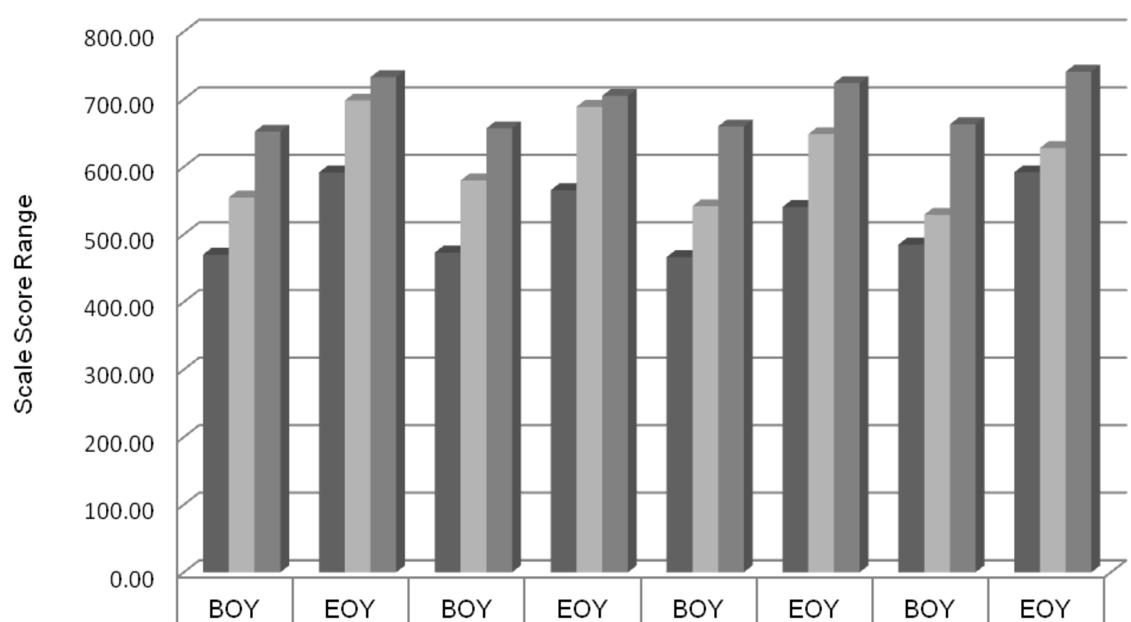


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	450.57	545.62	492.19	553.95	461.05	555.42	384.50	414.50
4th grade	537.13	676.61	537.65	637.93	540.77	632.68	491	595
5th grade	591.35	675.41	651.79	700.54	612.11	698.35	683	702

Average Scale Score on the Star Math Test by Grade Level

Figure 7. STAR Math BOY and EOY scores for Title School-7.

Title School-8. TS-8 had between 120 and 150 students who took the Star Math test during academic years 2005-2008 and 55 who took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one exception to this is the fourth grade class of 2007-2008 to the fifth grade class of 2008-2009 which had 14.64 points of growth from EOY to BOY testing periods. The first third grade class which was tracked from 2005-2008 demonstrated 253.65 points of growth. The second third grade class which can be followed from 2006-2009 had 267.69 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 8.



	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	470.25	591.84	473.31	565.58	466.61	540.63	485.00	592.00
4th grade	554.76	698.22	579.9	688.98	541.83	648.45	529.03	628
5th grade	652.17	732.8	657.07	705.24	659.90	723.90	663.09	741

Average Scale Score on Star Math Test by Grade Level

Figure 8. STAR Math BOY and EOY scores for Title School - 8.

Title School-9. TS-9 had between 190 and 195 students who took the Star Math test during academic years 2005-2008 and four who took the test during the 2008-2009 academic year. With the lack of student scores for the 2008-2009 the testing window was not used for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 246.84 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 9.

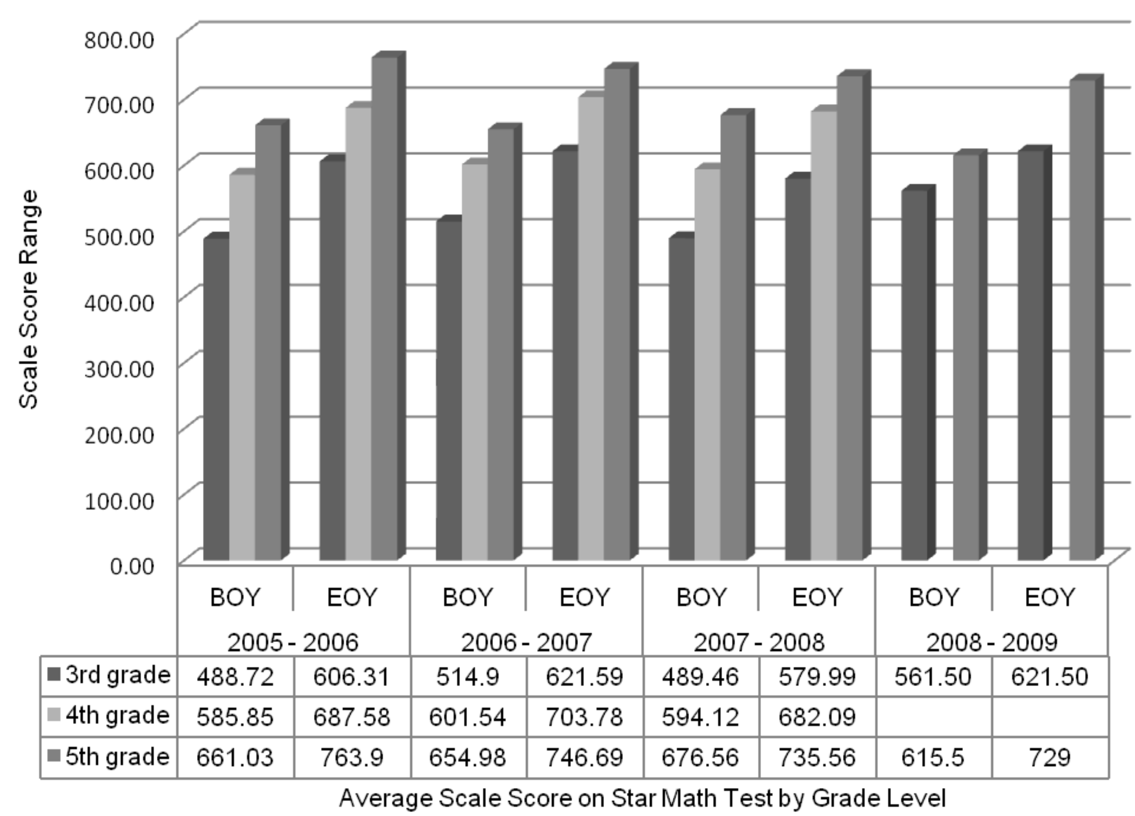
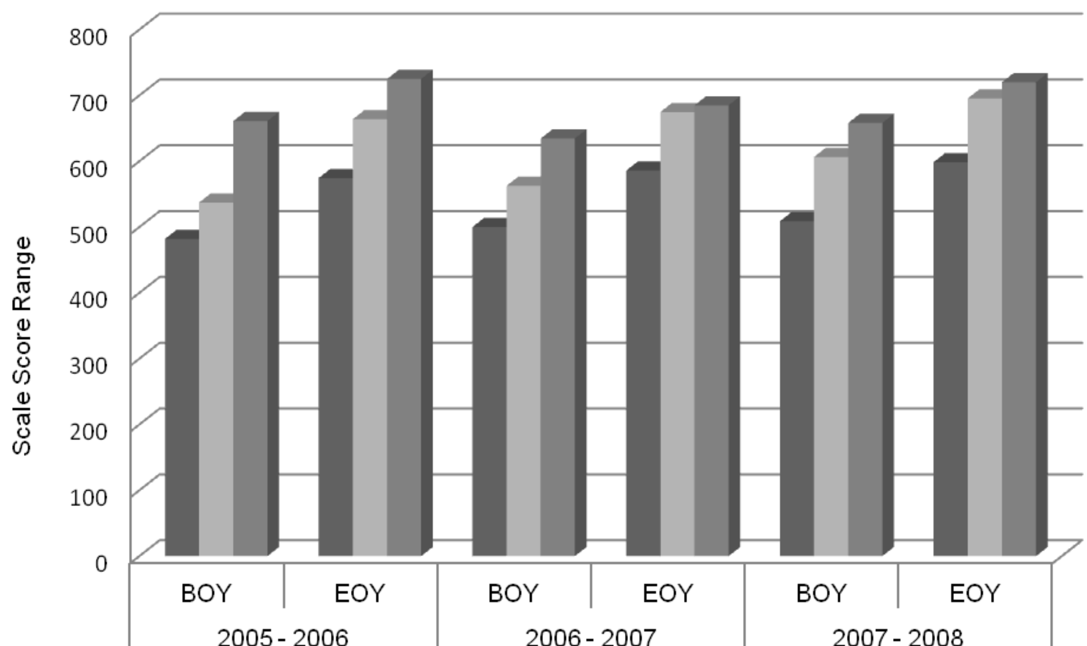


Figure 9. STAR Math BOY and EOY scores for Title School-9.

Title School-10. TS-10 had between 110 and 125 students who took the Star Math test during academic years 2005-2008 and none who took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one exception to this is the fourth grade class of 2006-2007 to the fifth grade class of 2007-2008 which had summer growth of 20.78 points. The one third grade class which was tracked from 2005-2008 demonstrated 238.08 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 10.

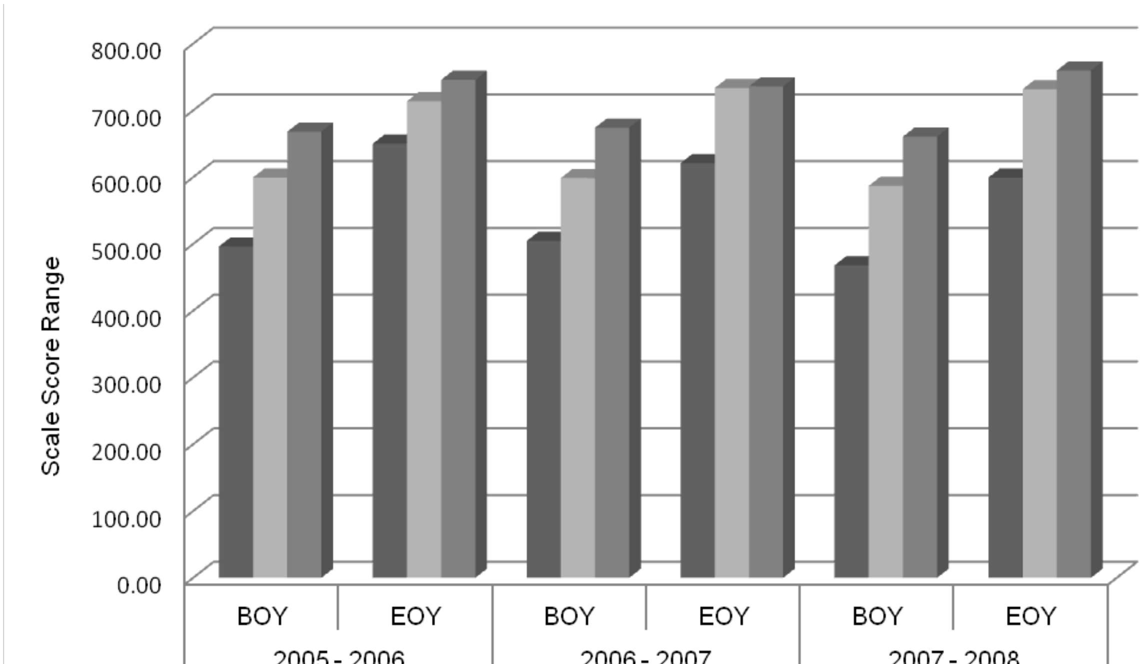


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY
3rd grade	482.03	574.53	500.06	585.79	508.83	598.63
4th grade	537.33	663.91	562.71	674.74	606.57	695.51
5th grade	661.1	725	634.59	685	658.2	720.11

Average Scale Score on Star Math Test by Grade Level

Figure 10. STAR Math BOY and EOY scores for Title School-10.

Title School-11. TS-11 had between 85 and 100 students who took the Star Math test during academic years 2005-2008 and three who took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 263.85 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 11.

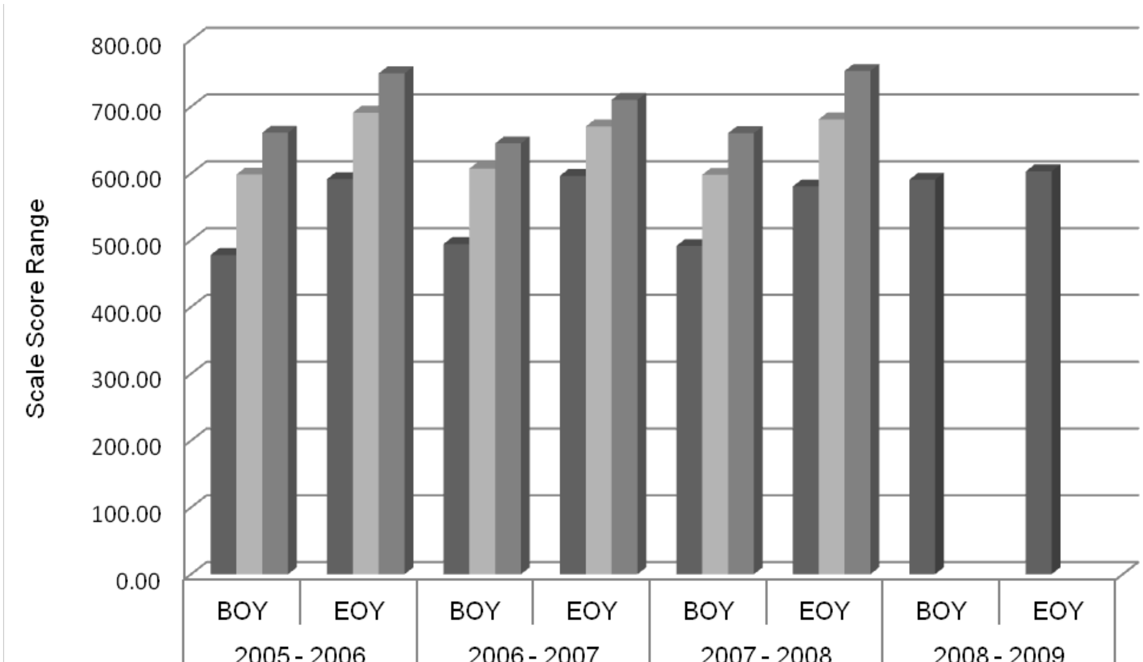


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY
3rd grade	496.17	650.17	504.5	621	467.93	599.46
4th grade	599.58	713.68	598.73	733.58	586.97	731.76
5th grade	668.08	745.78	674.19	736.03	660.68	759.75

Average Scale Score on Star Math Test by Grade Level

Figure 11. STAR Math BOY and EOY scores for Title School-11.

Title School-12. TS-12 had between 110 and 120 students who took the Star Math test during academic years 2005-2008 and two who took the test during the 2008-2009 academic year. Due to the lack of data in 2008-2009 this testing window was not used for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 245.94 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 12.

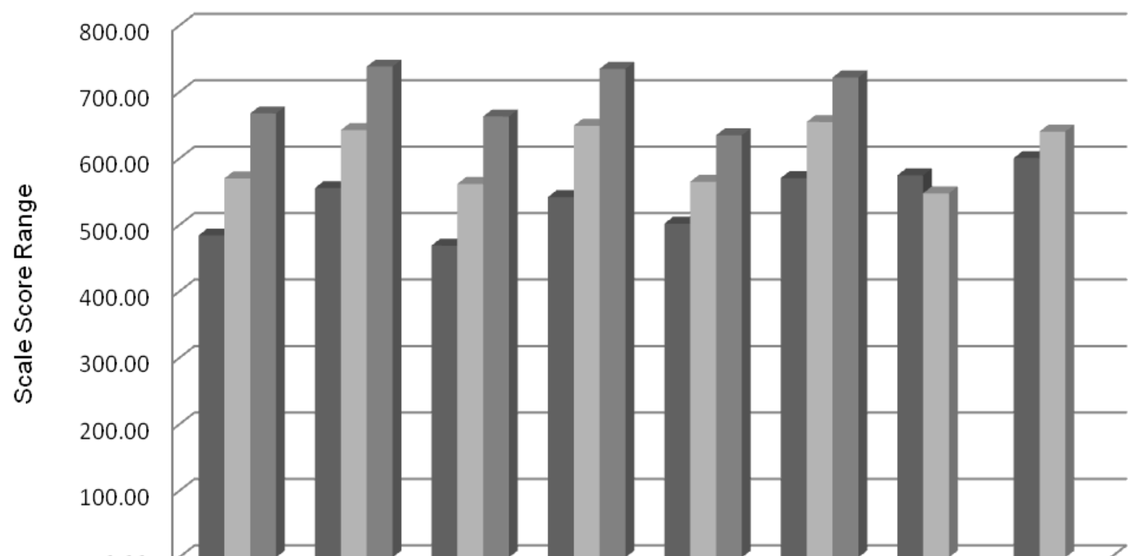


	2005 - 2006		2006 - 2007		2007 - 2008		2008 - 2009	
	BOY	EOY	BOY	EOY	BOY	EOY	BOY	EOY
3rd grade	477.71	591.43	494.16	596.33	491.35	580.52	590.50	603.00
4th grade	598.39	690.86	607.06	670.29	597.95	680.88		
5th grade	660.97	749.81	644.95	710.22	660.32	753.34		

Average Scale Score on Star Math Test by Grade Level

Figure 12. STAR Math BOY and EOY scores for Title School-12.

Title School-13. TS-13 had between 55 and 135 students who took the Star Math test during academic years 2005-2008, and two who took the test during the 2008-2009 academic year. Due to the lack of data in 2008-2009 this testing window was not used for comparison. The loss of achievement over the summer was evident for one class (the 2006-2007 fourth grade to 2007-2008 fifth grade class). By comparing the EOY scores with the BOY scores, all other classes were found to show growth. The one third grade class which was tracked from 2005-2008 demonstrated 237.71 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 13.

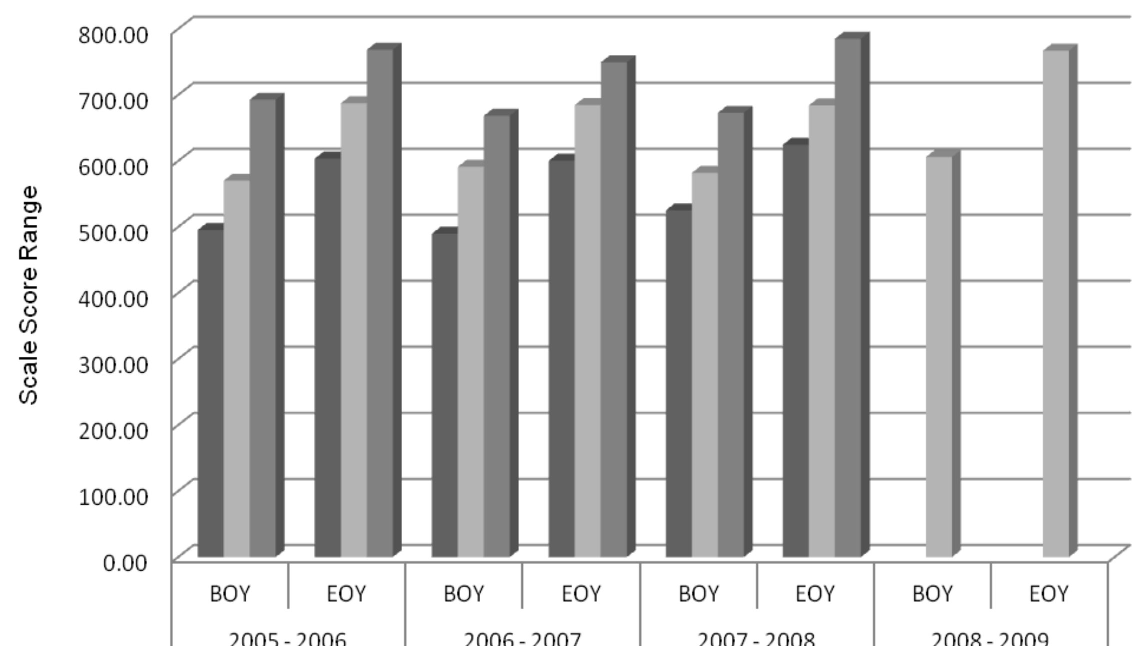


	BOY	EOY	BOY	EOY	BOY	EOY	BOY	EOY
	2005 - 2006		2006 - 2007		2007 - 2008		2008 - 2009	
3rd grade	484.56	556	469.29	542.29	502.35	570.96	575	601
4th grade	570.43	643.1	562.1	649.67	565.44	655.31	548	641
5th grade	668.22	738.74	663.61	735.39	635.45	722.27		

Average Scale Score on the Star Math Test by Grade Level

Figure 13. STAR Math BOY and EOY scores for Title School -13.

Title School-14. TS-14 had between 60 and 70 students who took the Star Math test during academic years 2005-2008, and one who took the test during the 2008-2009 academic year. Due to the lack of data in 2008-2009 this testing window was not used for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 289.76 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 14.

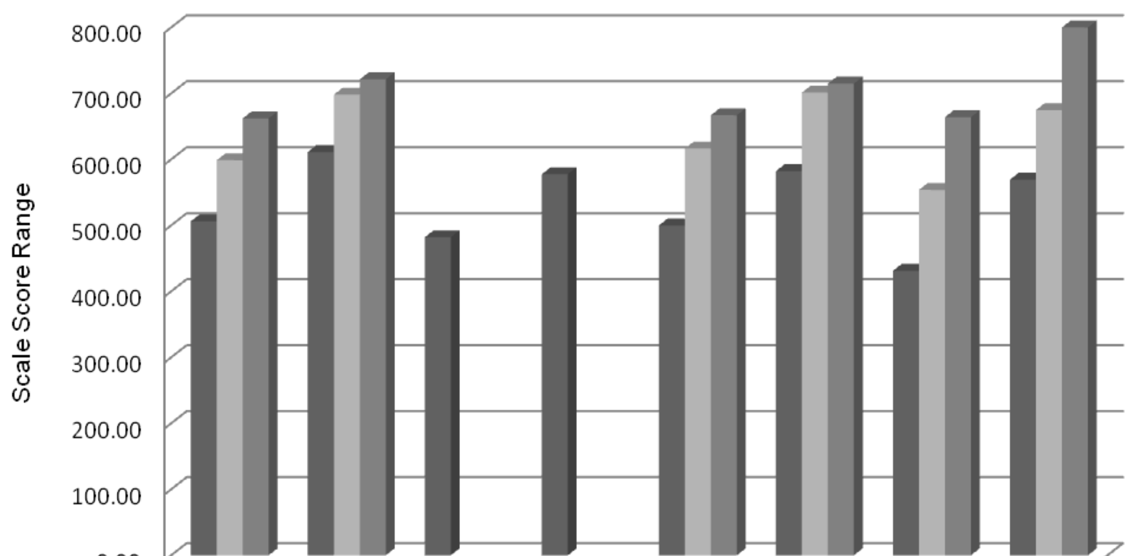


	2005 - 2006		2006 - 2007		2007 - 2008		2008 - 2009	
	BOY	EOY	BOY	EOY	BOY	EOY	BOY	EOY
3rd grade	495.35	603.61	489.71	600.29	525.19	624.62		
4th grade	570.16	687.32	591.08	684.81	581.92	684.23	606	767
5th grade	692.78	768.3	668.42	749.42	672.89	785.11		

Average Scale Score on Star Math Test by Grade Level

Figure 14. STAR Math BOY and EOY scores for Title School -14.

Title School-15. TS-15 had between 140 and 150 students who took the Star Math test during academic years 2005-2006 and 2007-2008, and 15 who took the test during the 2008-2009 academic year. For a reason unknown to the researcher or the agency responsible for storage and collection of the student test data only two student scores were collected for the 2006-2007 school year. Due to the lack of data in 2006-2007 and 2008-2009 these testing windows were not used for comparison. The one third grade class which was tracked from 2005-2006 into fifth grade in 2007-2008 demonstrated 208.75 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 15.

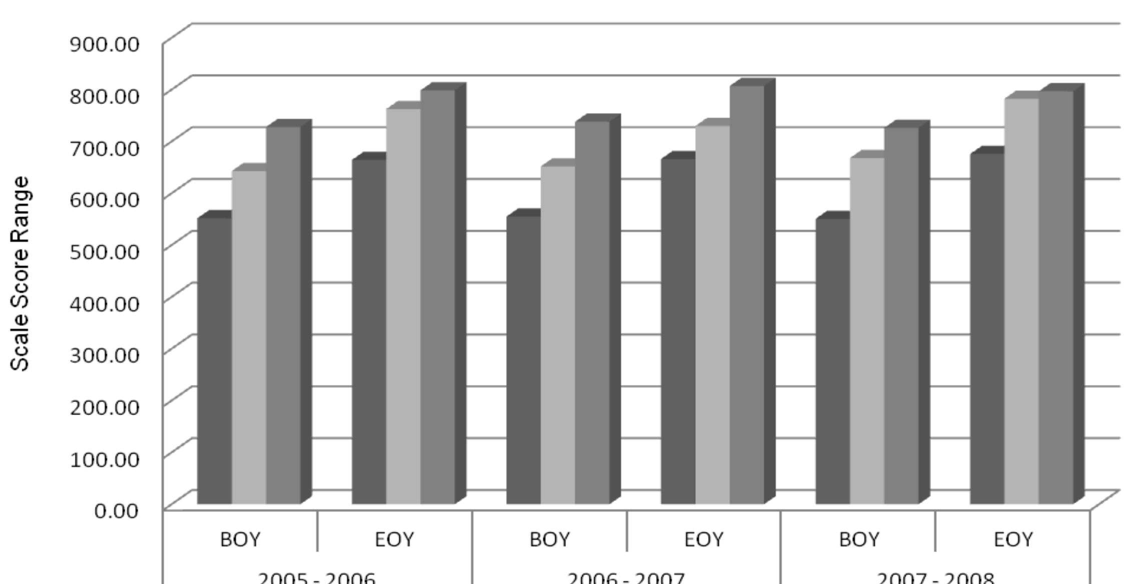


	2005 - 2006		2006 - 2007		2007 - 2008		2008 - 2009	
	BOY	EOY	BOY	EOY	BOY	EOY	BOY	EOY
3rd grade	506.06	611.17	482	577.5	499.91	582.18	431.11	569.33
4th grade	598.74	698			616.39	701.32	553.75	674.75
5th grade	662.1	721.29			666.92	714.81	664	800

Average Scale Score on Star Math Test by Grade Level

Figure 15. STAR Math BOY and EOY scores for Title School -15.

Non-Title School-7. For the purpose of comparing growth between Title and Non-Title schools, the Title schools were sorted from the highest percentage of F/R to lowest percentage. The Non-Title schools were sorted in the same manner. NTS-7 had between 265 and 290 students who took the Star Math test during academic years 2005 – 2008, and none who took the test during the 2008-2009 academic year. Due to the lack of data in 2008-2009 this testing window was not used for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next, with the exception of the third grade class of 2006-2007 to fourth grade class of 2007-2008 which demonstrated 1.83 points of growth over the summer. The one third grade class which was tracked from 2005-2008 demonstrated 245.03 points of growth. The Non-Title schools had an average score which started nearly 50 points higher than the Title schools'. The averages for the BOY and EOY testing windows are displayed in Figure 16.

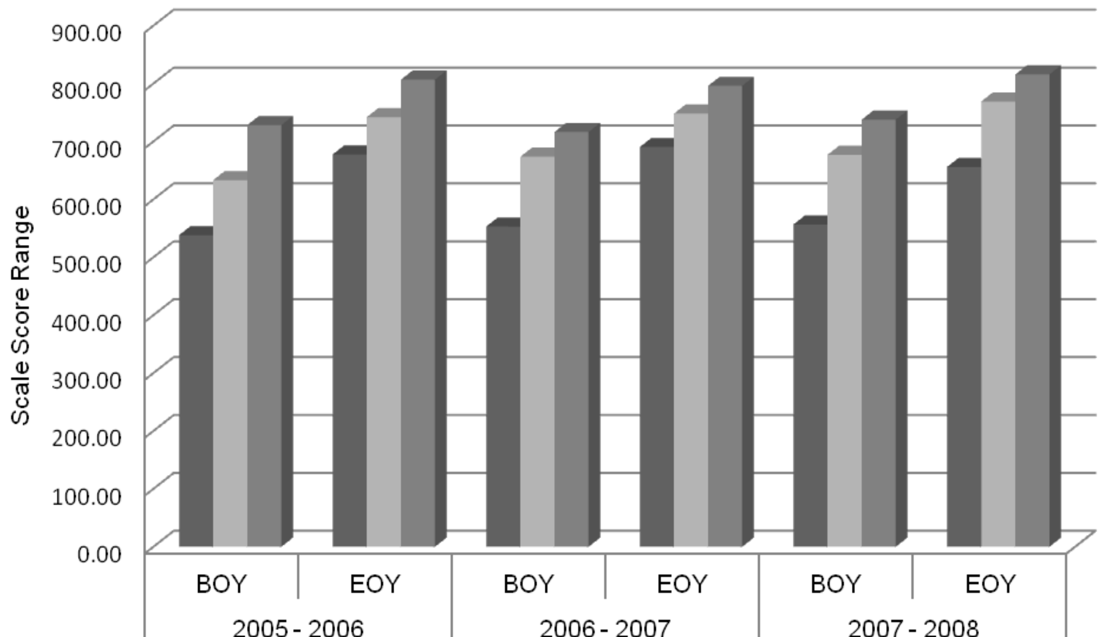


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY
3rd grade	551.90	664.36	555.08	666.17	550.7	675.82
4th grade	642.85	762.52	651.95	729.9	668	782.62
5th grade	728	798.72	738.17	807.13	726.32	796.93

Average Scale Score on Star Math Test by Grade Level

Figure 16. STAR Math BOY and EOY scores for Non-Title School -7.

Non-Title School-6. NTS-6 had between 130 and 150 students who took the Star Math test during academic years 2005-2008, and none who took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The one third grade class which was tracked from 2005-2008 demonstrated 277.61 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 17.

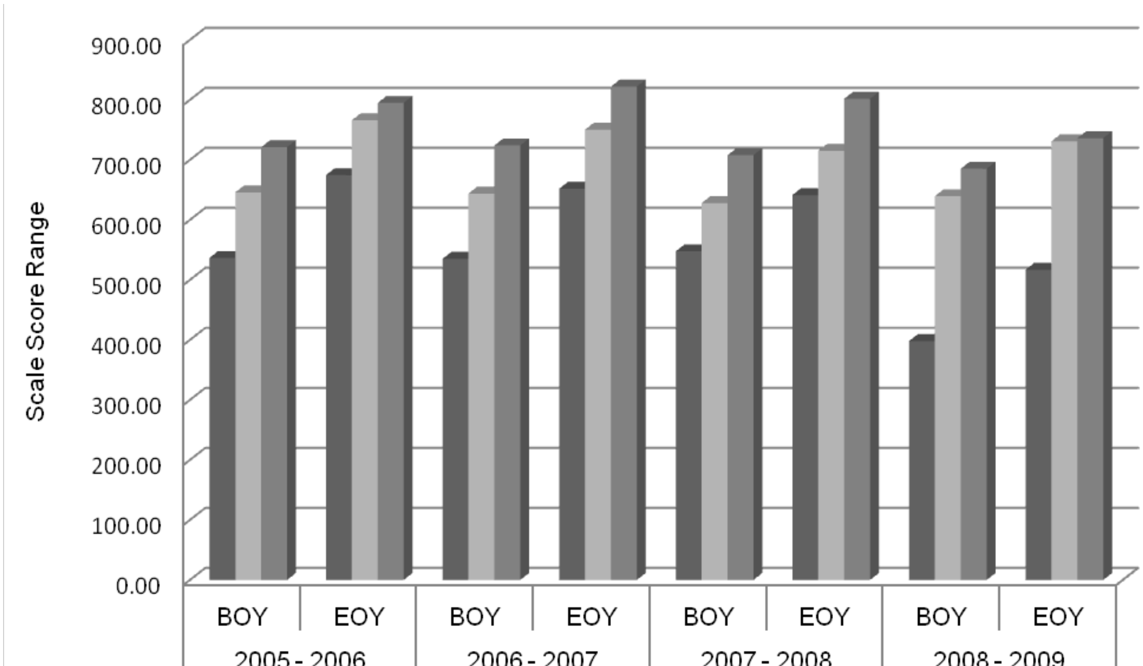


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY
3rd grade	538.14	677.53	553.07	690.44	556.65	655.96
4th grade	633.23	742.02	673.63	748.14	677.06	769.02
5th grade	728.31	806.73	716.35	796.09	737.71	815.75

Average Scale Score on Star Math Test by Grade Level.

Figure 17. STAR Math BOY and EOY scores for Non-Title School -6.

Non-Title School-5. NTS-5 had between 140 and 170 students who took the Star Math test during academic years 2005-2008 and 71 who took the test during the 2008-2009 academic year. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The first third grade class which was tracked from 2005-2008 demonstrated 265.32 points of growth. The second third grade class which was tracked from 2006-2009 demonstrated 201.12 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 18.

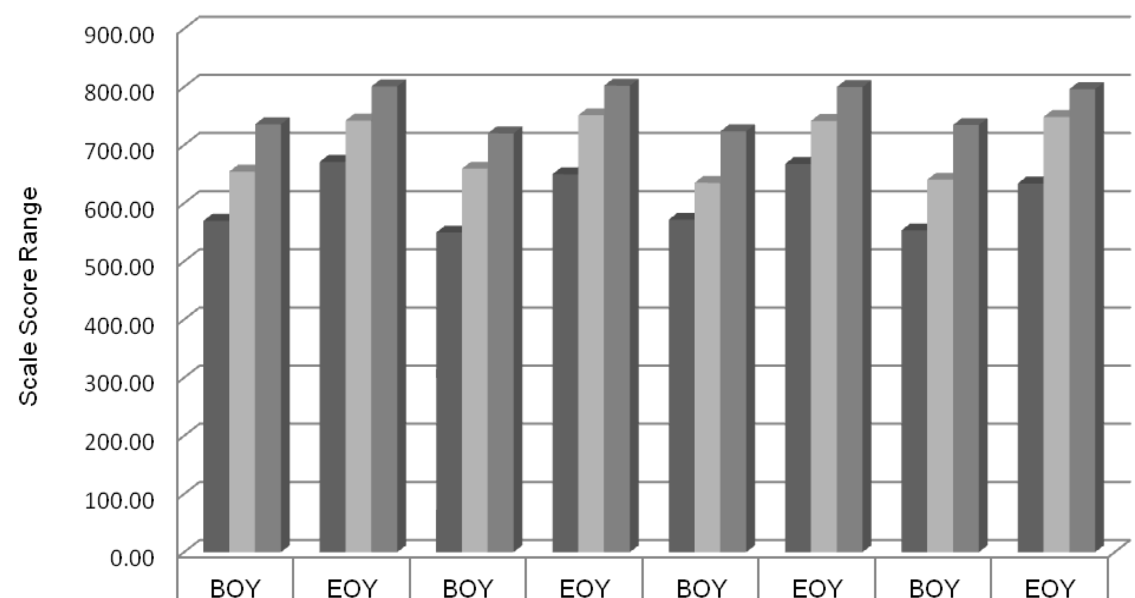


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	536.55	674.6	535.11	651.93	547.74	641.4	398	517
4th grade	645.87	766.09	643.94	750.45	628.1	715.16	639.55	731.14
5th grade	721.2	795.08	724.12	822.22	707.89	801.87	685.31	736.23

Average Scale Score on Star Math Test by Grade Level.

Figure 18. STAR Math BOY and EOY scores for Non-Title School -5.

Non-Title School-4. NTS-4 had between 170 and 200 students who took the Star Math test during academic years 2005-2009. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The first third grade class which was tracked from 2005-2008 demonstrated 230 points of growth. The second third grade class which was tracked from 2006-2009 demonstrated 246.68 points of growth. The averages for the BOY and EOY testing windows are displayed in Figure 19.

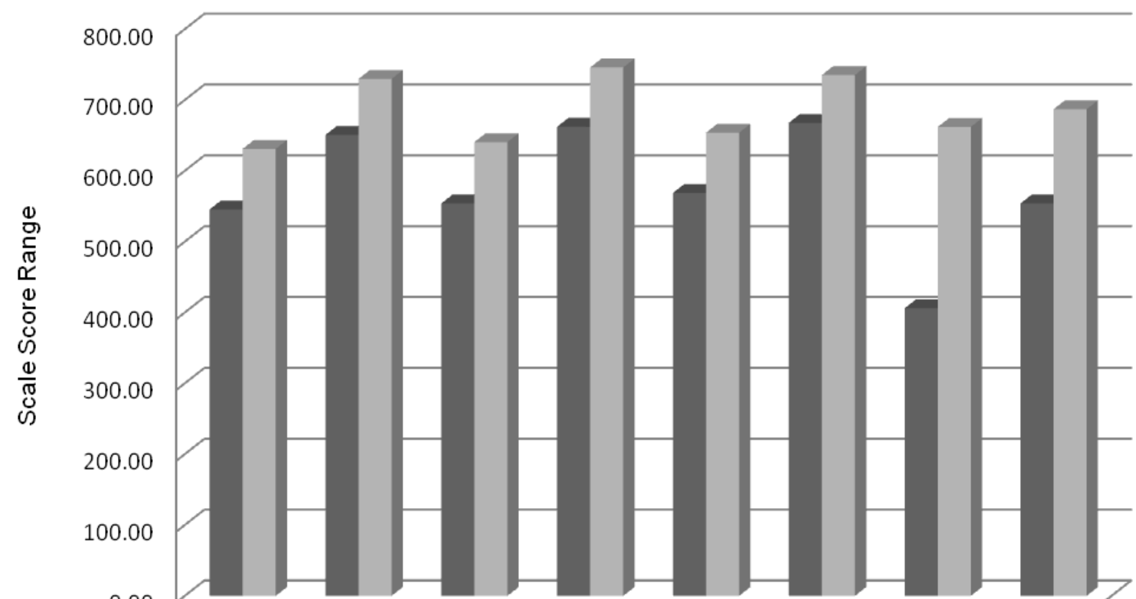


	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	569.91	671.33	549.57	649.84	571.75	667.6	553.38	633.92
4th grade	654.51	742.22	659.34	751.28	635.14	741.51	640.5	748.43
5th grade	735.9	800.9	720.22	802.16	723.76	799.91	734.53	796.25

Average Scale Score on Star Math Test by Grade Level

Figure 19. STAR Math BOY and EOY scores for Non-Title School -4.

Non-Title School-3. NTS-3 was one of two schools in the study which only contained third and fourth grade. The students from this school and NTS-1 will attend fifth grade at NTS-2. NTS-3 had between 220 and 250 students who took the Star Math test during academic years 2005-2008 and two who took the test during the 2008-2009 academic year. Due to the lack of data in 2008-2009 this testing window was not used for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The averages for the BOY and EOY testing windows are displayed in Figure 20.



	2005 - 2006 BOY	2005 - 2006 EOY	2006 - 2007 BOY	2006 - 2007 EOY	2007 - 2008 BOY	2007 - 2008 EOY	2008 - 2009 BOY	2008 - 2009 EOY
3rd grade	545.53	650.69	554.02	662.27	568.9	667.8	406	554
4th grade	631.09	729.85	640.63	746.01	653.92	735.37	662	687

Average Scale Score on Star Math Test by Grade Level

Figure 20. STAR Math BOY and EOY scores for Non-Title School-3.

Non-Title School-2. NTS-2 had only fifth grade student test data, and NTS-3 and NTS-1 had students transitioning into this fifth and sixth grade center. NTS-2 had between 200 and 250 fifth grade students who took the Star Math test during academic years 2005-2008 and none who took the test during the 2008-2009 academic year. The EOY scores for all three years varied 1.18 points from the maximum to the minimum. The averages for the BOY and EOY testing windows are displayed in Figure 21.

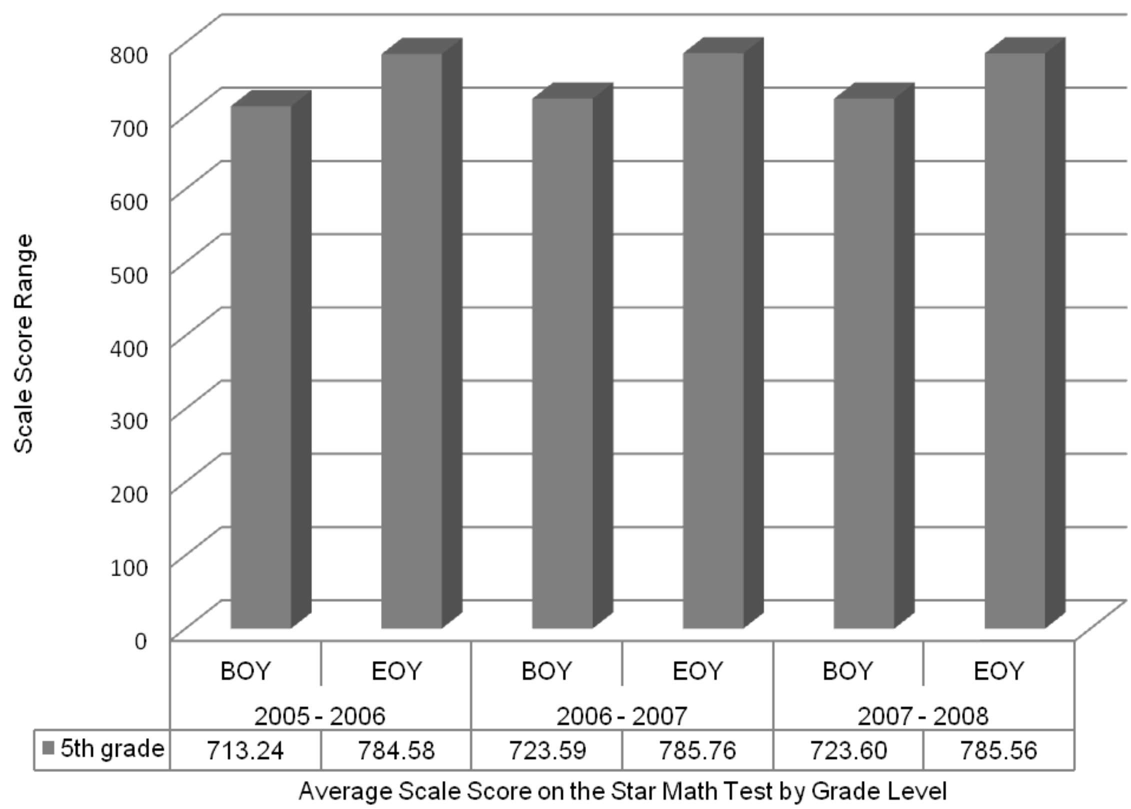
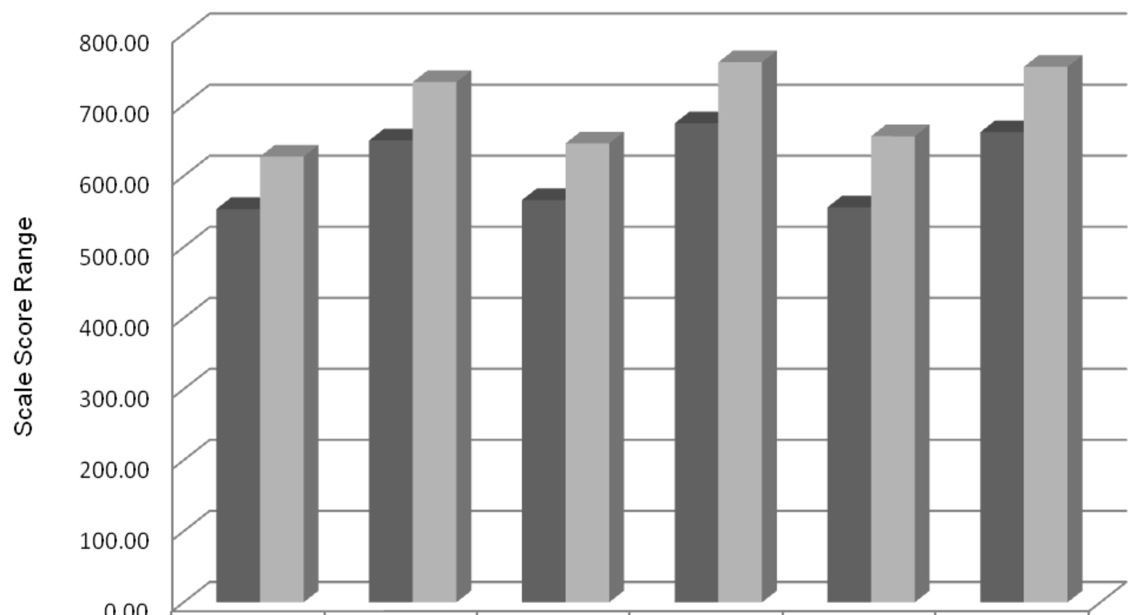


Figure 21. STAR Math BOY and EOY scores for Non-Title School -2.

Non-Title School-1. NTS-1 was one of two schools in the study which only contained third and fourth grade, and the students from this school and NTS-3 will attend fifth grade at NTS-2. NTS-1 had between 220 and 230 students who took the test during academic years 2005-2008 and none who took the test during academic year 2008-2009. Due to the lack of data in 2008-2009 this testing window was not used for comparison. The loss of achievement over the summer was evident by comparing the EOY scores with the BOY scores from the previous grade to the next. The averages for the BOY and EOY testing windows are displayed in Figure 22.



	BOY	EOY	BOY	EOY	BOY	EOY
	2005 - 2006		2006 - 2007		2007 - 2008	
3rd grade	553.67	650.19	566.26	674.39	556.13	661.85
4th grade	627.47	732.44	646.15	760.31	656.14	753.87

Average Scale Score on Star Math Test by Grade Level

Figure 22. STAR Math BOY and EOY scores for Non-Title School -1.

***t*-test**. A *t*-test was applied to determine any significance in the difference between scores for Title schools and Non-Title schools with the BOY and EOY scores for the 2005-2008 academic years (see Table 2). The alpha level identified for significance was: $p < \alpha$ .05 (Trochim, 2006d). In academic year 2008-2009, there were not enough data for in the study. Due to the 2008-2009 academic being a transition year between the STAR Math and Performance Series, not every school tested in the STAR Math system, leading to a lack of data. The *t*-test was conducted where *t* equals the mean of the Non-Title schools, either BOY or EOY score for each year; minus the mean of the Title schools, either BOY or EOY score for each year. This total was then divided by the standard error of the difference of the means. The *t*-value was derived from this formula, then using a *t* distribution chart the numbers were found with the alpha level to determine a level of confidence. With the *t* values clustered together the same level of confidence was accepted for all tests. The alpha level was set at 0.05.

Table 2

Level of Confidence for STAR Math Test between Title and Non-Title Schools

Test	*t* - value	Alpha Level	Level of Confidence
2005-2006 - BOY	18.04	0.05	1.73
2005-2006 - EOY	17.54	0.05	1.73
2006-2007 - BOY	17.66	0.05	1.73
2006-2007 - EOY	19.33	0.05	1.73
2007-2008 - BOY	19.42	0.05	1.73
2007-2008 - EOY	20.15	0.05	1.73

Statistical landmarks. The statisical landmarks in this study are presented in Table 3 to show the differences between the two groups. In the landmarks, there was a difference in starting points for the Non-Title and Title schools. There was also a difference in the average. To help make the comparisons in growth the average BOY and

EOY scores can be used to compare Title to Non-Title schools. The average growth between Non-Title and Title schools was in the 90-100 point range, however the BOY and EOY scores for the Non-Title schools were a higher average than those of the Title school.

Table 3

Statistical Landmarks for STAR Math Test BOY and EOY Grouped by Title Status

Academic Year	Test Period	Maximum	Minimum	Mean	Standard Deviation
2005-2006	BOY (NTS)	904	223	636.22	108.66
2005-2006	EOY (NTS)	1016	329	731.93	103.56
2005-2006	BOY (TS)	852	156	564.05	113.13
2005-2006	EOY (TS)	947	194	662.63	115.78
2006-2007	BOY (NTS)	1004	301	643.10	104.57
2006-2007	EOY (NTS)	1077	258	736.71	102.45
2006-2007	BOY (TS)	898	196	570.51	113.50
2006-2007	EOY (TS)	958	137	657.45	115.06
2007-2008	BOY (NTS)	944	246	647.18	107.10
2007-2008	EOY (NTS)	1008	273	736.86	103.46
2007-2008	BOY (TS)	912	67	569.86	116.26
2007-2008	EOY (TS)	940	258	656.53	118.97

Pearson r. A Pearson *r* was used to analyze the data for correlation. The correlation between the BOY and EOY scores for each academic year are presented in Table 4. All the years for Title and Non-Title Schools were found to have a high positive correlation. A high positive correlation supports the connection between the independent and dependent variable.

Table 4

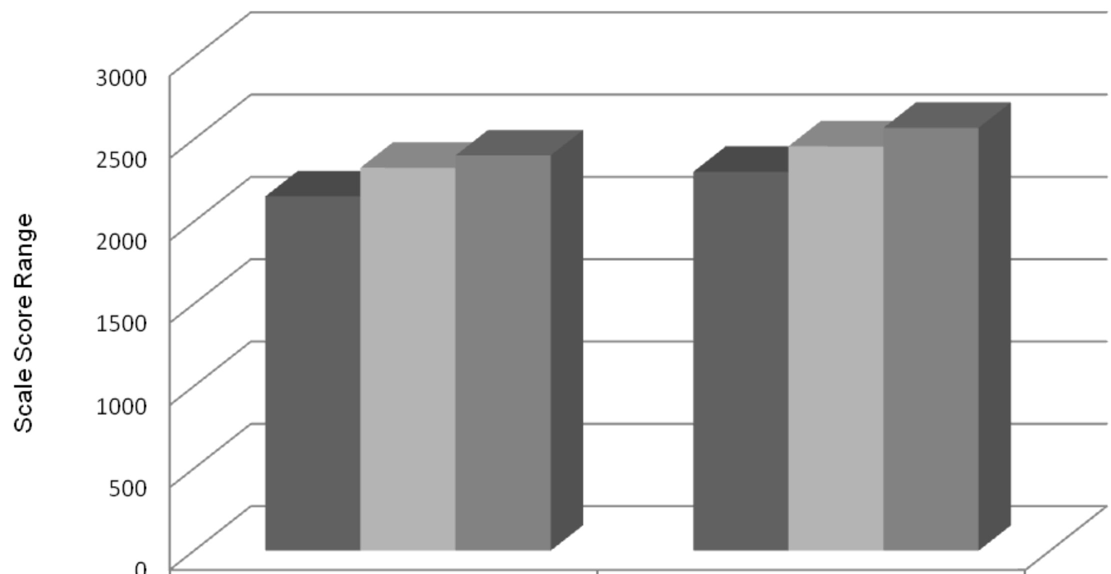
Correlation Factor of STAR Math Test BOY and EOY for Title and Non-Title Schools

School Year	Type of School	Correlation
2005-2006	Non-Title Schools	0.77
2005-2006	Title Schools	0.79
2006-2007	Non-Title Schools	0.78
2006-2007	Title Schools	0.81
2007-2008	Non-Title Schools	0.77
2007-2008	Title Schools	0.80

Research Question Two

What difference exists in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%? The student scores from the 22 schools in the study on the Performance Series Mathematics test were analyzed and a *t*-test was applied to determine significance, utilizing the alpha level for significance: $p < \alpha$ .05 (Trochim, 2006d). A Pearson *r* was used to identify if a correlation existed. The closer the number is to +1.00, the stronger the correlation (Trochim, 2006a). The Performance Series Mathematics test was used in academic years 2008-2010. However, 2008-2009 was a year in which the district was transitioning between the STAR Math test and Performance Series test. Not every school took the Performance Series Mathematics test during the academic year. Only 695 student files existed for the 2008-2009 academic year, from five of the 22 schools in the study (four Title and one Non-Title) compared to 3,000 in academic year 2009-2010. The 2008-2009 year data were documented; however, it was not as rich in support as previous years studied. A summary of each of the schools follows with a figure representing average scores for each grade level during BOY and EOY test windows.

Title School-1. TS-1 did not implement the Performance Series test in 2008-2009 but had 124 students who took the Performance Series in 2009-2010. The average scores are represented in Figure 23. There was a larger BOY average score gap between third and fourth grade than fourth and fifth grade. The gaps remained through the EOY testing window for third and fourth grade but increased between fourth and fifth grade. Even though the fourth grade EOY test is higher than the fifth grade BOY test, it is not a fair comparison for summer learning loss since the two are different groups of students.

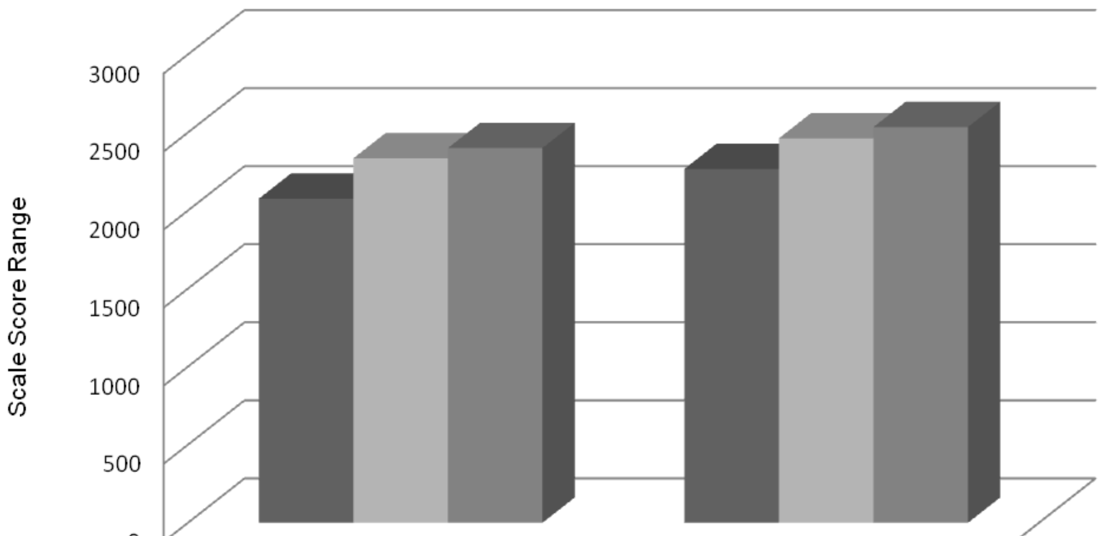


	BOY	EOY
3rd Grade	2152.65	2301.88
4th Grade	2326.69	2456.61
5th Grade	2401.39	2569.14

Average Scale Score on Performance Series Test by Grade Level

Figure 23. TS-1 average scale score on 2009-2010 Performance Series test.

Title School-2. TS-2 did not implement the Performance Series test in 2008-2009 but had 76 students who took the Performance Series in 2009-2010. The average scores are represented in Figure 24. There was a larger BOY average score gap between third and fourth grade than fourth and fifth grade. The gaps remained through the EOY testing window for third and fourth grade; however, the gaps decreased between fourth and fifth grade. Even though the fourth grade EOY score is higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

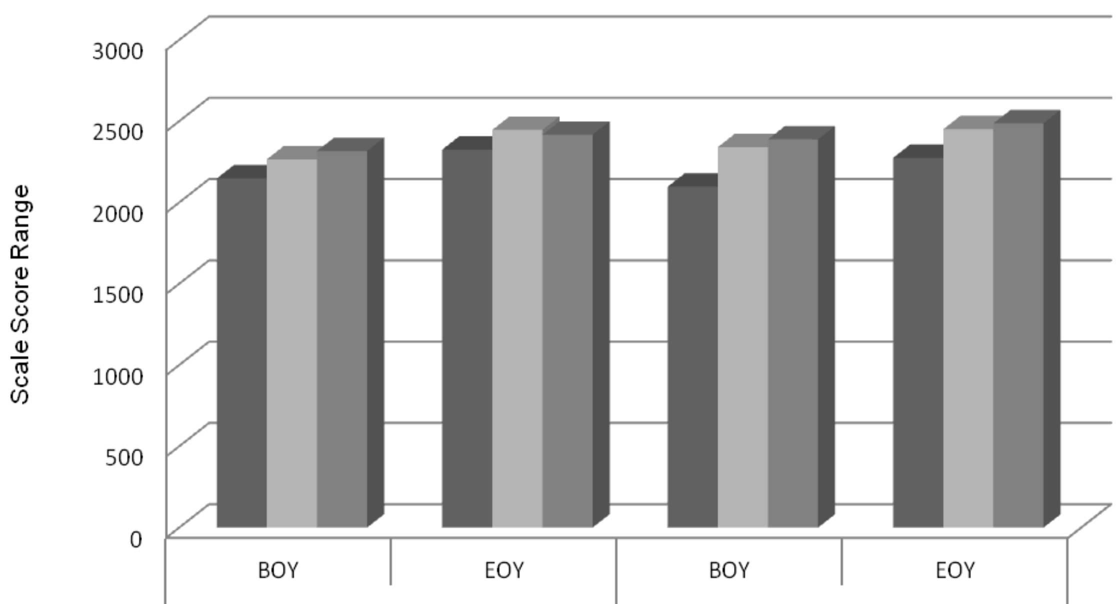


	BOY	EOY
3rd Grade	2076.07	2266.22
4th Grade	2334.76	2462.43
5th Grade	2400.21	2534.61

Average Scale Score on Performance Series Test by Grade Level

Figure 24. TS-2 average scale score on 2009-2010 Performance Series test.

Title School-3. TS-3 implemented the Performance Series test in 2008-2009, and 140 students took the Performance Series. In 2009-2010, 111 students took the Performance Series. The average scale scores are in Figure 25. In 2008-2009, the fourth grade outscored the fifth grade through the school year, ending with an average which was 40 points higher on the EOY. In 2009-2010, the growth remained fairly constant throughout the school year for all grade levels. With two years of data, growth was evident for the third grade class which moved to fourth grade (improvement the in BOY in 2009-2010 from the EOY in 2008-2009); however, the fourth grade students who moved to fifth grade decreased 58 points from the BOY in 2009-2010 to the EOY in 2008-2009.

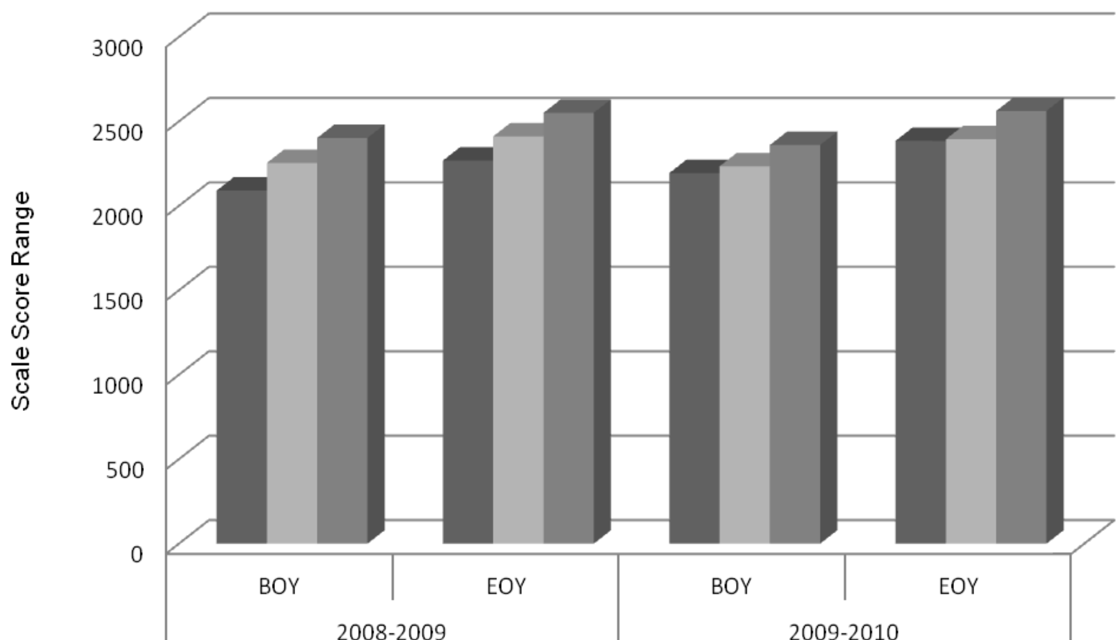


	2008-2009 BOY	2008-2009 EOY	2009-2010 BOY	2009-2010 EOY
3rd Grade	2147.83	2325.63	2097.33	2275.14
4th Grade	2265.8	2446.78	2340.66	2450.85
5th Grade	2316.45	2416.68	2388.33	2486.8

Average Scale Score on Performance Series Test by Grade Level

Figure 25. TS-3 average scale score on Performance Series test.

Title School-4. TS-4 implemented the Performance Series test in 2008-2009, and 121 students took the Performance Series. In 2009-2010, 115 students took the Performance Series. The average scale scores are in Figure 26. In 2008-2009 all grade levels grew at a consistent pace. In 2009-2010, the third grade outperformed fourth grade so by the EOY test window there was a 9 point difference between the two grades. The third grade class, which moved to fourth grade, decreased from the EOY in 2008-2009 to the BOY in 2009-2010 by 34 points. The fourth grade students who moved to fifth grade decreased 51 points from the BOY in 2009-2010 to the EOY in 2008-2009.

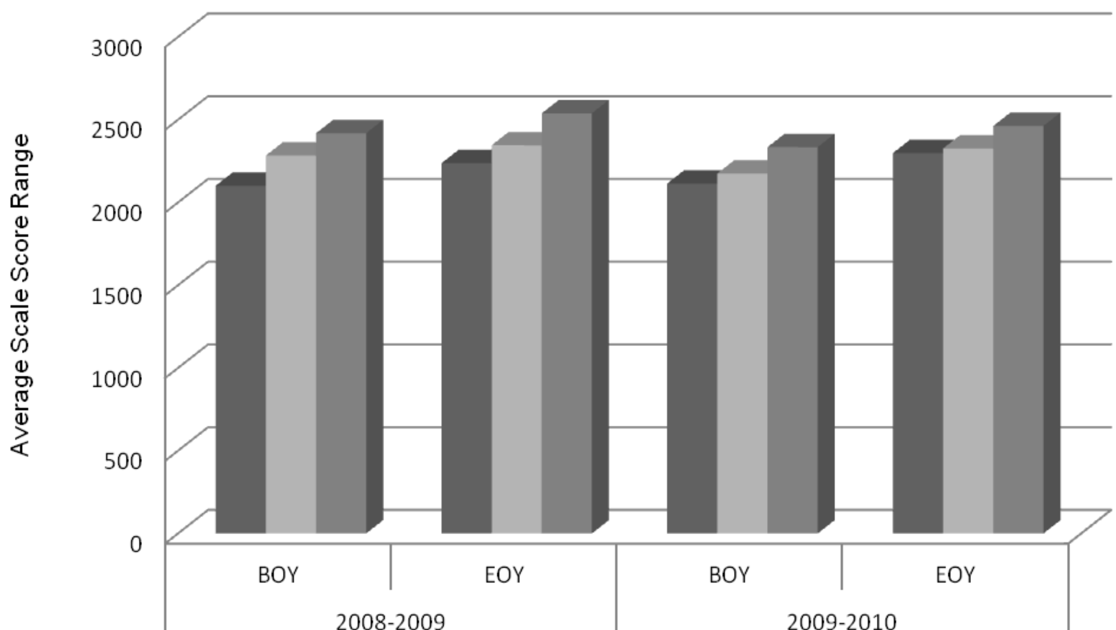


	2008-2009 BOY	2008-2009 EOY	2009-2010 BOY	2009-2010 EOY
3rd Grade	2090.38	2268.35	2194.03	2385.24
4th Grade	2254.5	2411.66	2234.24	2394.74
5th Grade	2402.4	2551.08	2360	2561.91

Average Scale Score on Performance Series by Grade Level

Figure 26. TS-4 average scale score on Performance Series Test.

Title School-5. TS-5 implemented the Performance Series test in 2008-2009, and 82 students took the Performance Series. In 2009-2010, 86 students took the Performance Series. The average scale scores are in Figure 27. In 2008-2009, the grade levels grew at similar paces. In 2009-2010, the third grade grew at a greater rate than fourth grade, and by the EOY test window there was only a 27 point difference. The third grade class, which moved to fourth grade, decreased from the EOY in 2008-2009 to the BOY in 2009-2010 by 62 points. The fourth grade students who moved to fifth grade decreased 11 points from the BOY in 2009-2010 to the EOY in 2008-2009.

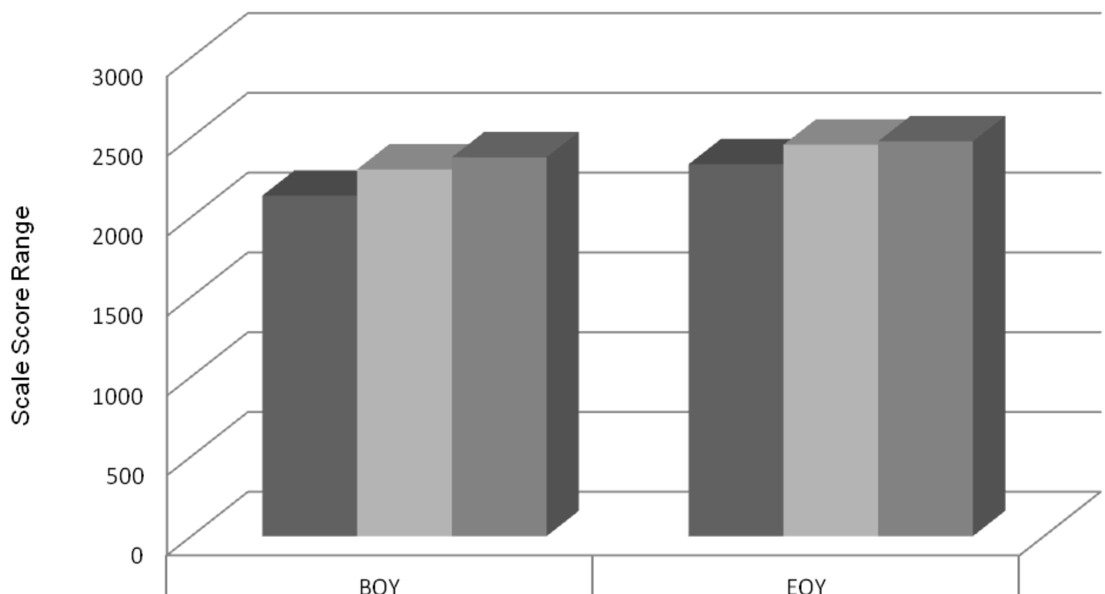


	2008-2009 BOY	2008-2009 EOY	2009-2010 BOY	2009-2010 EOY
3rd Grade	2100.91	2237	2114.42	2298.61
4th Grade	2283.32	2345.39	2175.33	2326.52
5th Grade	2418.21	2538.93	2334.31	2462.24

Average Scale Score on Performance Series Test by Grade Level

Figure 27. TS-5 average scale score on Performance Series test.

Title School-6. TS-6 did not implement the Performance Series test in 2008-2009 but had 124 students who took the Performance Series in 2009-2010. The average scale scores are in Figure 28. There was a larger BOY average score gap between third and fourth grade than fourth and fifth grade. The gaps remained through the EOY testing window for third and fourth grade. The gap decreased between fourth and fifth grade to only 22 points. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

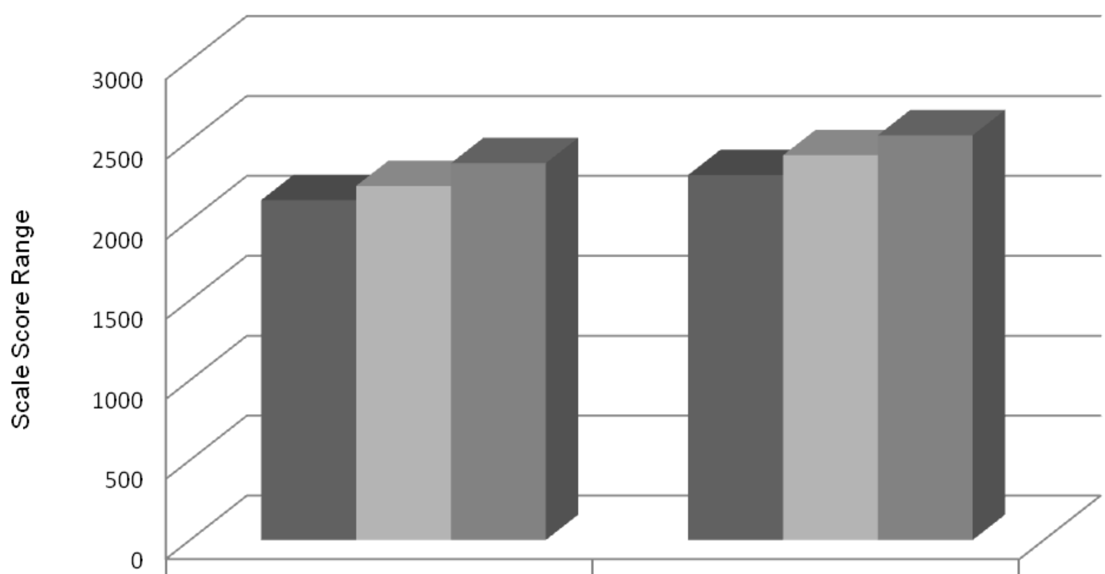


	BOY	EOY
3rd Grade	2134.26	2331.17
4th Grade	2298.85	2452.91
5th Grade	2374.14	2474.78

Average Scale Score on Performance Series by Grade Level

Figure 28. TS-6 average scale score on 2009-2010 Performance Series test.

Title School-7. TS-7 did not implement the Performance Series test in 2008-2009 but had 114 students who took the Performance Series in 2009-2010. The average scale scores are in Figure 29. There was a larger BOY average score gap between fourth and fifth grade than third and fourth grade. The gaps remained consistent through the EOY testing window. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.



	BOY	EOY
3rd Grade	2126.55	2283.26
4th Grade	2214.78	2406.41
5th Grade	2357.61	2532

Average Scale Score on Performance Series Test by Grade Level

Figure 29. TS-7 average scale score on 2009-2010 Performance Series test.

Title School-8. TS-8 did not implement the Performance Series test in 2008-2009 but had 94 students who took the Performance Series in 2009-2010. The average scale scores are in Figure 30. There was a larger BOY average score gap between third and fourth grade than fourth and fifth grade. The gaps remained through the EOY testing window for fourth and fifth grade but decreased between third and fourth grade. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

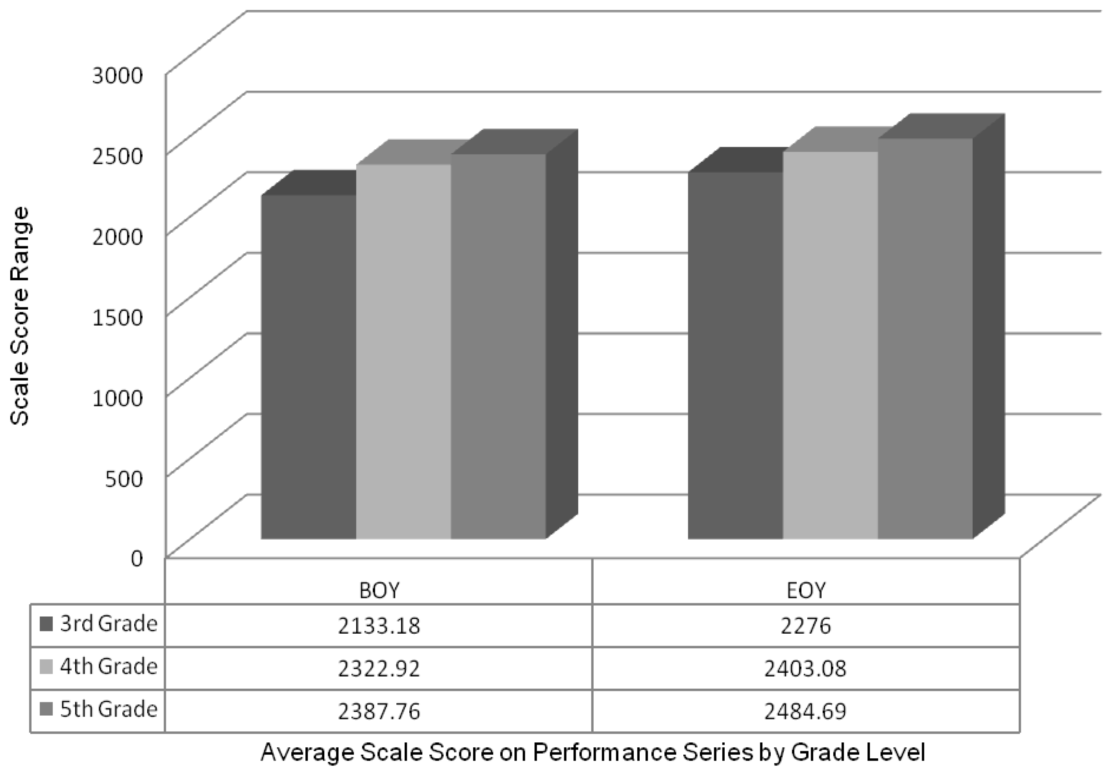
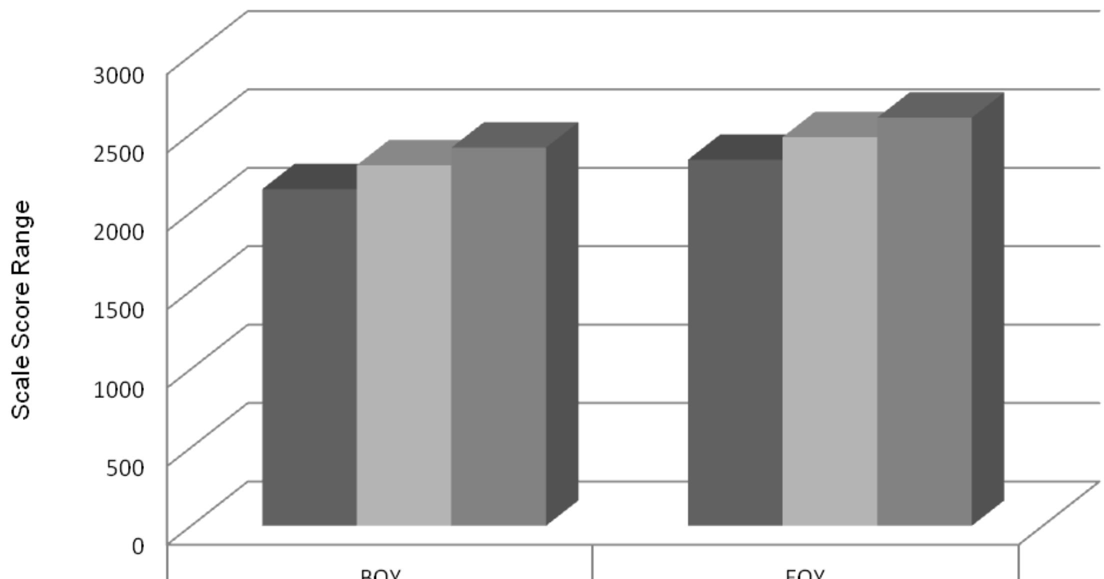


Figure 30. TS-8 average scale score on 2009-2010 Performance Series test.

Title School-9. TS-9 did not implement the Performance Series test in 2008-2009 but had 157 students who took the Performance Series in 2009-2010. Figure 31 shows the average scale scores for TS-9. There was a larger BOY average score gap between third and fourth grade than fourth and fifth grade. The gaps remained through the EOY testing window for all grade levels. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

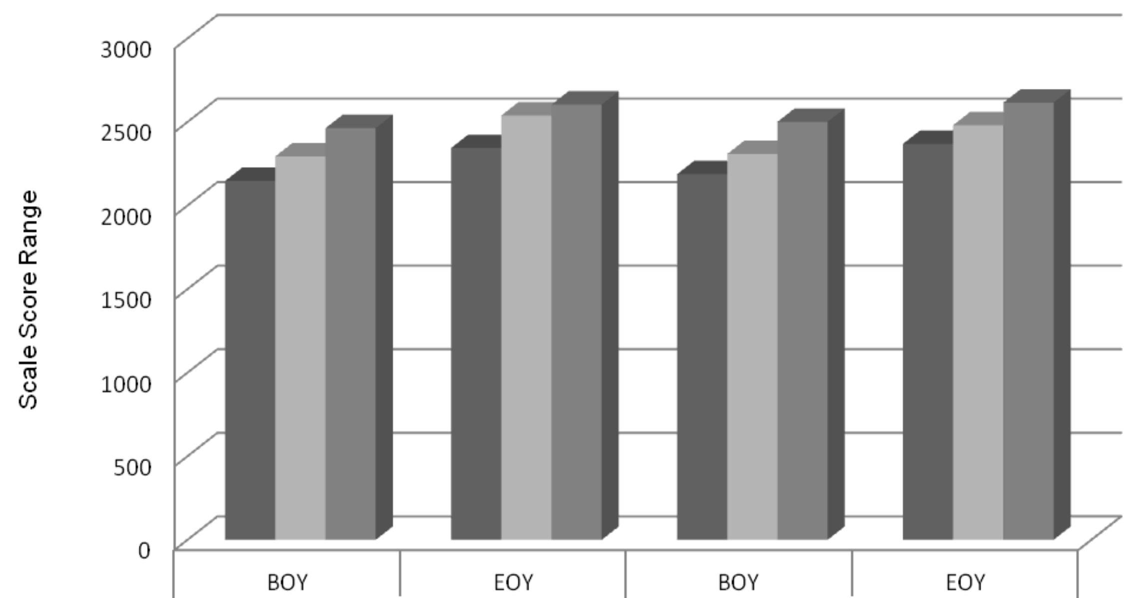


	BOY	EOY
3rd Grade	2146.38	2334.56
4th Grade	2299.4	2478.36
5th Grade	2411.59	2602.34

Average Scale Score on Performance Series by Grade Level

Figure 31. TS-9 average scale score on 2009-2010 Performance Series test.

Title School-10. TS-10 implemented the Performance Series test in 2008-2009, and 93 students took the Performance Series. In 2009-2010, 102 students took the Performance Series. The average scale scores are in Figure 32. In 2008-2009, the fourth grade grew at a higher rate than the fifth grade through the school year, ending with an average which was 66 points higher on the EOY from 169 points on the BOY. In 2009-2010, the growth remained fairly constant throughout the school year for all grade levels. The third grade class, which moved to fourth grade, decreased from the EOY in 2008-2009 to the BOY in 2009-2010 by 36 points. The fourth grade students who moved to fifth grade decreased 37 points from the BOY in 2009-2010 to the EOY in 2008-2009.



	2008-2009 BOY	2008-2009 EOY	2009-2010 BOY	2009-2010 EOY
3rd Grade	2147.58	2344.5	2187.42	2369.33
4th Grade	2294.58	2538.89	2308.57	2481.2
5th Grade	2463.32	2604.52	2501.13	2615.64

Average Scale Score on Performance Series by Grade Level

Figure 32. TS-10 average scale score on Performance Series test.

Title School-11. TS-11 did not implement the Performance Series test in 2008-2009 but had 100 students who took the Performance Series in 2009-2010. Figure 33 shows the average scale scores for TS-11. The gaps remained through the EOY testing window for all grade levels. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

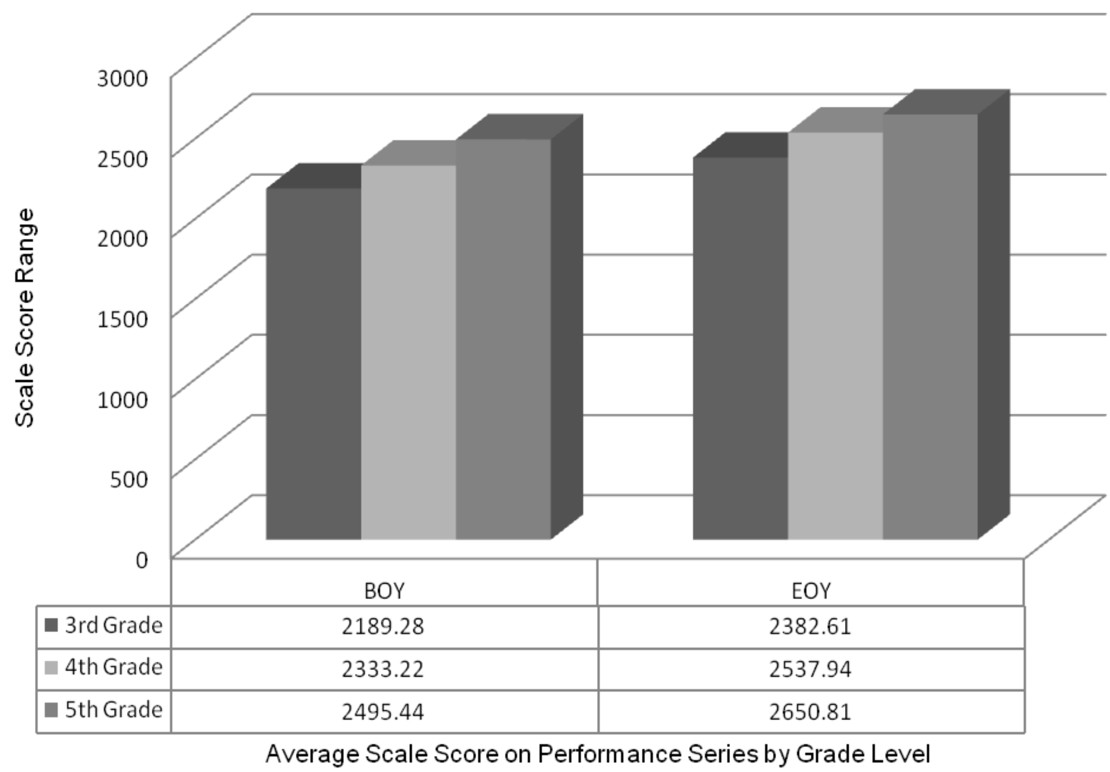
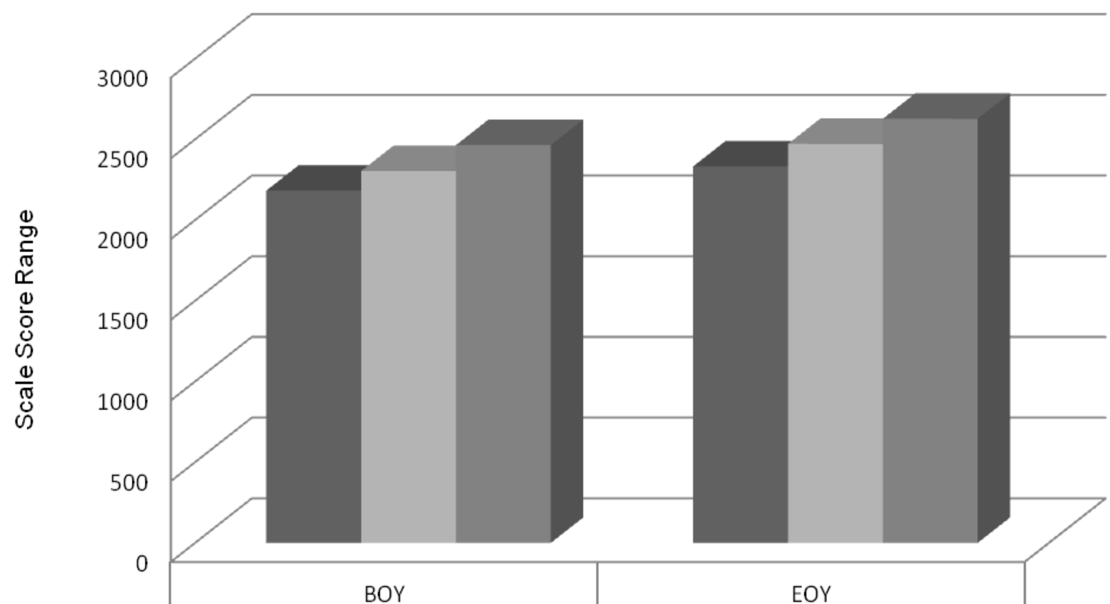


Figure 33. TS-11 average scale score by 2009-2010 Performance Series test.

Title School-12. TS-12 did not implement the Performance Series test in 2008-2009 but had 131 students who took the Performance Series in 2009-2010. Figure 34 shows the average scale scores for TS-12. The gaps remained consistent between all grade levels for both test windows. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.



	BOY	EOY
3rd Grade	2182.02	2332.05
4th Grade	2303.49	2471.55
5th Grade	2464.37	2627.16

Average Scale Score on Performance Series by Grade Level

Figure 34. TS-12 average scale score on 2009-2010 Performance Series test.

Title School-13. TS-13 did not implement the Performance Series test in 2008-2009 but had 84 students who took the Performance Series in 2009-2010. Figure 35 shows the average scale scores for TS-13. There was a larger BOY average score gap between fourth and fifth grade than third and fourth grade. Third and fourth grade were both able to narrow the gap between the average score for that grade level and the average score for fifth grade. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

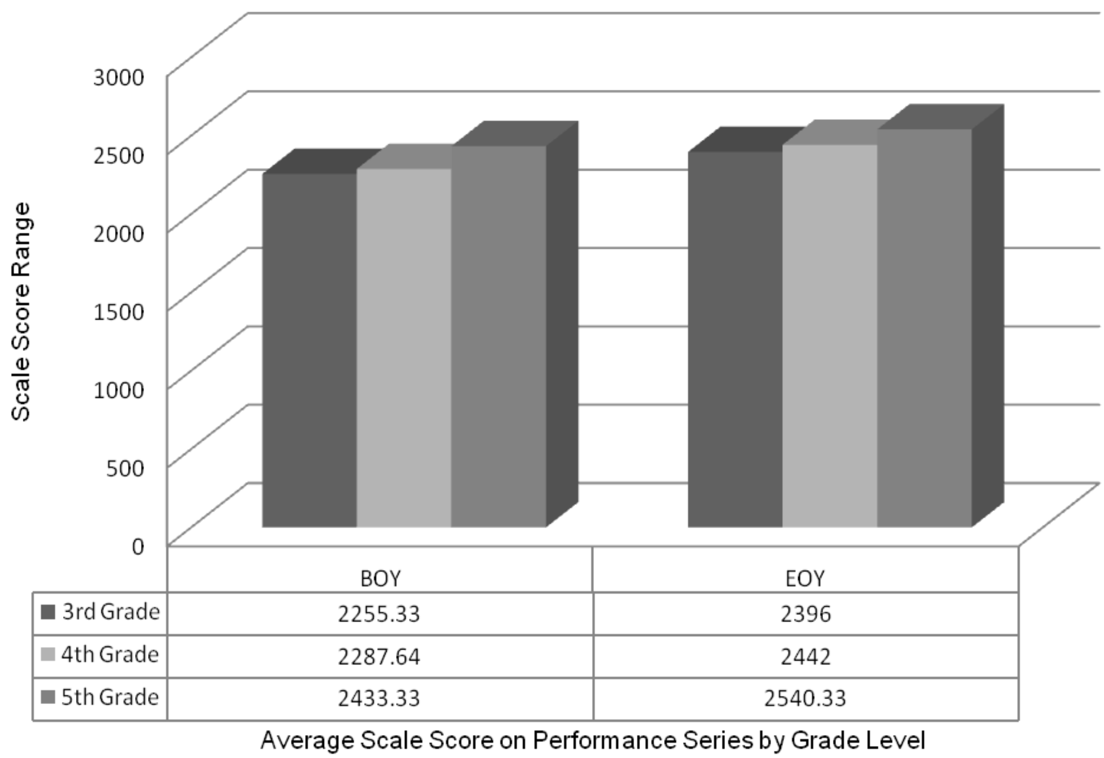
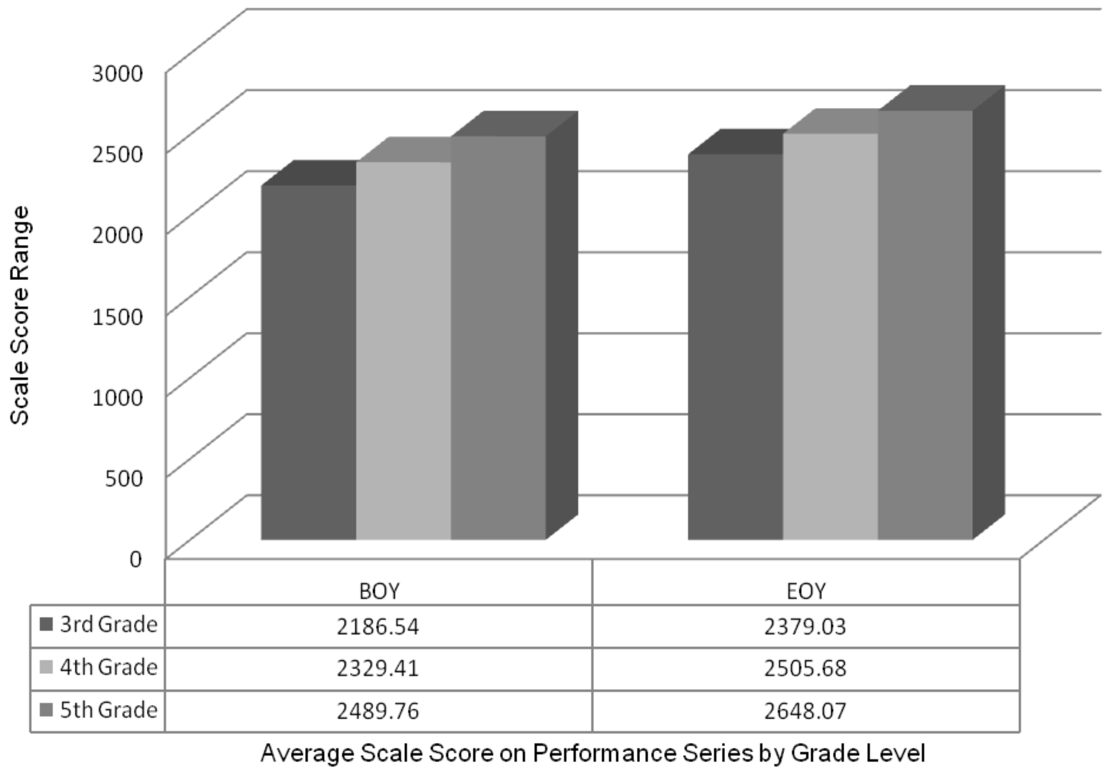


Figure 35. TS-13 average scale score on 2009-2010 Performance Series test.

Title School-14. TS-14 did not implement the Performance Series test in 2008-2009 but had 79 students who took the Performance Series in 2009-2010. Figure 36 shows the average scale score for TS-14. The gaps remained consistent through all grade levels in both testing windows. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.



	BOY	EOY
3rd Grade	2186.54	2379.03
4th Grade	2329.41	2505.68
5th Grade	2489.76	2648.07

Figure 36. TS-14 average scale score on 2009-2010 Performance Series test.

Title School-15. TS-15 did not implement the Performance Series test in 2008-2009 but had 152 students who took the Performance Series in 2009-2010. Figure 37 shows the average scale scores for TS-15. The gaps remained consistent through both testing windows and all grade levels. Even though the fourth grade EOY score was higher than the fifth grade BOY was, it is not a fair comparison for summer learning loss since the two are different groups of students.

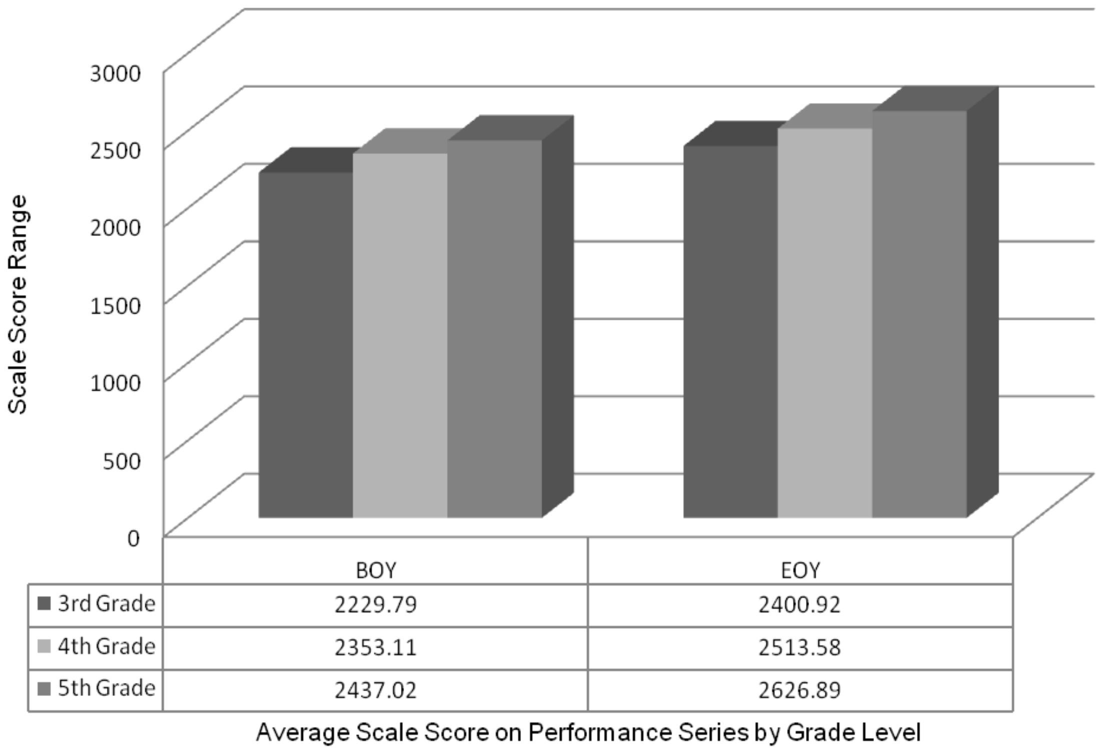
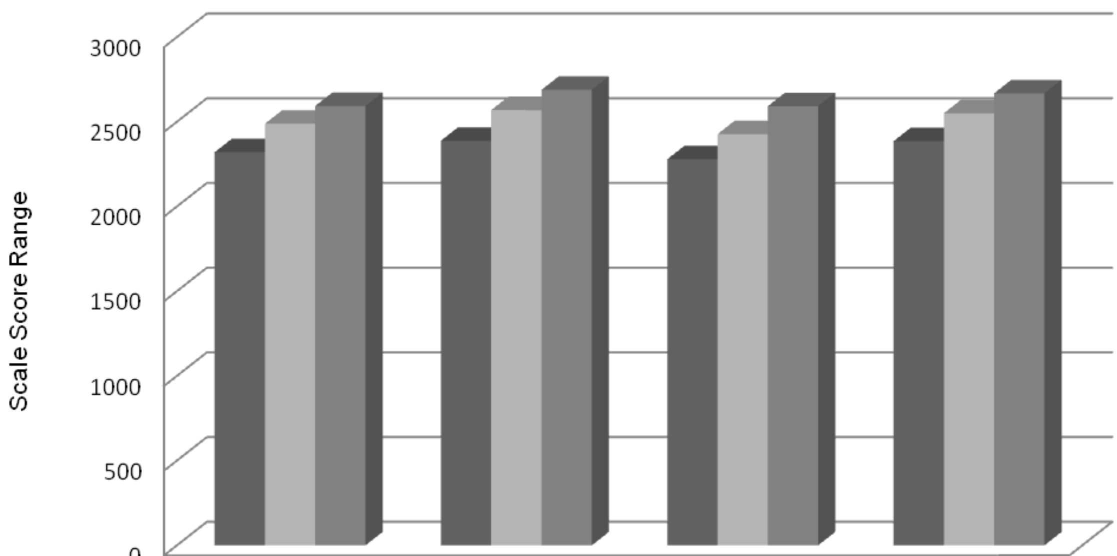


Figure 37. TS-15 average scale score on 2009-2010 Performance Series test.

Non-Title School-7. NTS-7 implemented the Performance Series test in 2008-2009, and 250 students took the Performance Series. In 2009-2010, 257 students took the Performance Series. The average scale scores are in Figure 38. In 2008-2009, the growth remained fairly constant throughout the school year for all grade levels. In 2009-2010, the growth remained fairly constant throughout the school year for all grade levels. The third grade class, which moved to fourth grade, increased from the EOY in 2008-2009 to the BOY in 2009-2010 by 39 points. The fourth grade students who moved to fifth grade increased 23 points from the EOY in 2008-2009 to the BOY in 2009-2010.

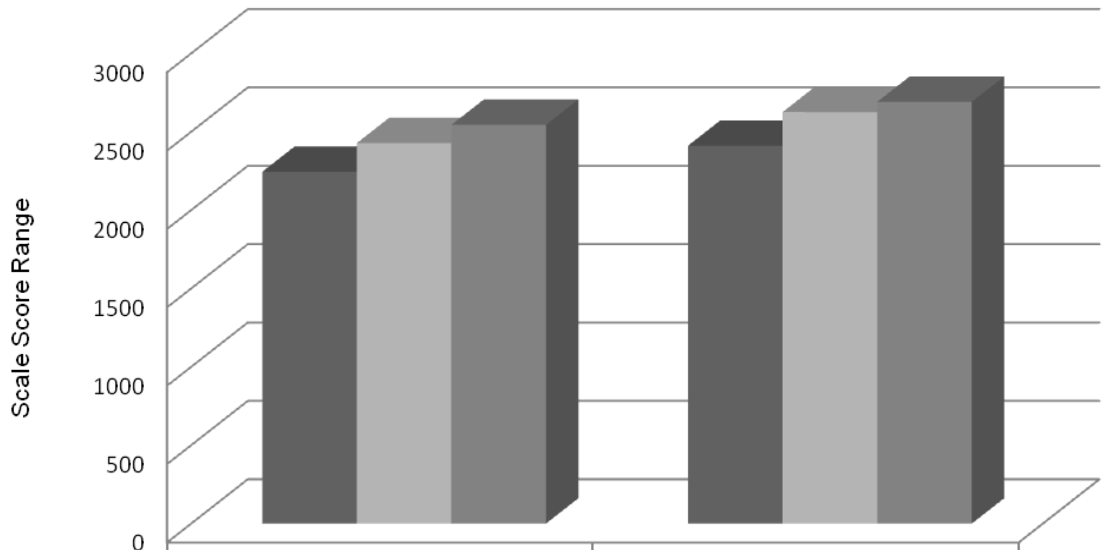


	BOY 2008-2009	EOY 2008-2009	BOY 2009-2010	EOY 2009-2010
3rd Grade	2320.2	2388.43	2279.02	2385.64
4th Grade	2488.44	2569.27	2427.11	2550.71
5th Grade	2593.48	2688.6	2592.44	2668.31

Average Scale Score on Performance Series Test by Grade Level

Figure 38. NTS-7 average scale score on Performance Series test.

Non-Title School-6. NTS-6 did not implement the Performance Series test in 2008-2009 but had 144 students who took the Performance Series in 2009-2010. Figure 39 has the average scale scores for NTS-6. The gaps remained consistent through both testing windows and all grade levels. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

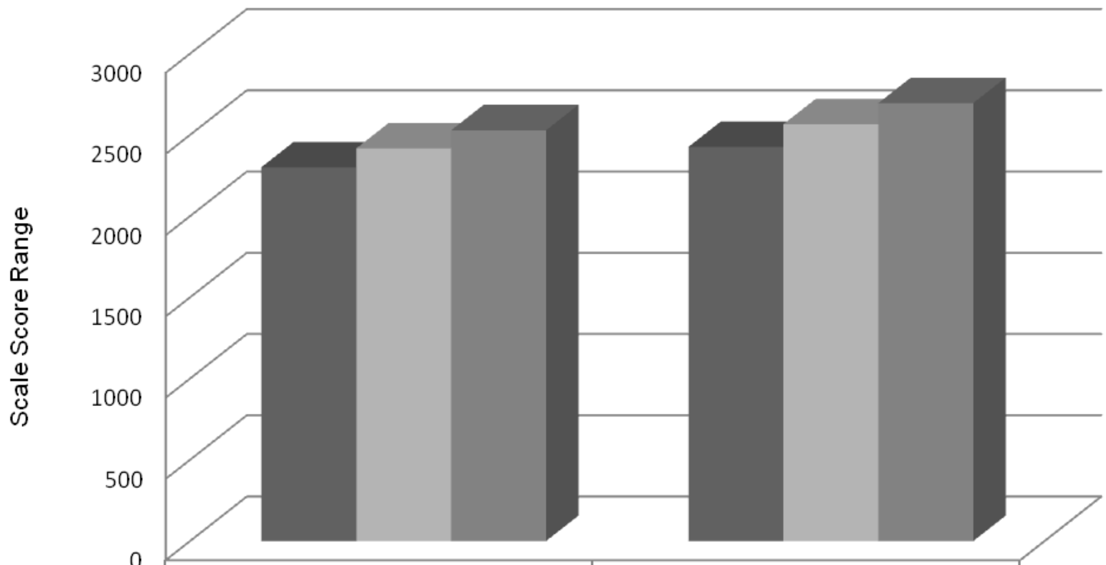


	BOY	EOY
3rd Grade	2244.2	2410.92
4th Grade	2427.53	2625.47
5th Grade	2544.13	2690.73

Average Scale Score on Performance Series by Grade Level

Figure 39. NTS-6 average scale score on 2009-2010 Performance Series test..

Non-Title School-5. NTS-5 did not implement the Performance Series test in 2008-2009 but had 200 students who took the Performance Series in 2009-2010. Figure 40 has the average scale scores for NTS-5. The gaps remained consistent through both testing windows and all grade levels. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.



	BOY	EOY
3rd Grade	2300.46	2426.25
4th Grade	2416.48	2565.85
5th Grade	2528.38	2695.78

Average Scale Score on Performance Series by Grade Level

Figure 40. NTS-5 average scale score on 2009-2010 Performance Series test.

Non-Title School-4. NTS-4 did not implement the Performance Series test in 2008-2009 but had 188 students who took the Performance Series in 2009-2010. Figure 41 has the average scale scores for NTS-4. The gaps remained consistent through both testing windows and all grade levels. Even though the fourth grade EOY score was higher than the fifth grade BOY score, it is not a fair comparison for summer learning loss since the two are different groups of students.

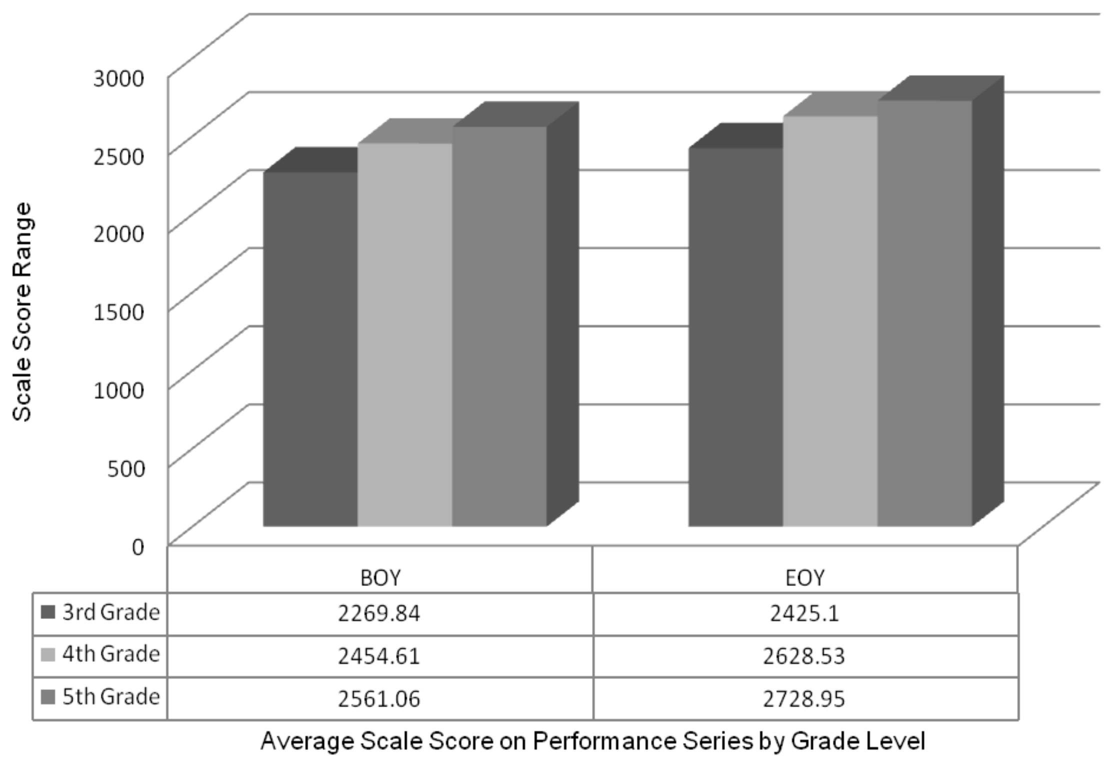


Figure 41. NTS-4 average scale score on 2009-2010 Performance Series test.

Non-Title School-3. NTS-3 did not implement the Performance Series test in 2008-2009 but had 199 students who took the Performance Series in 2009-2010. NTS-3 serves third and fourth grade, and all fifth graders attend NTS-2. Figure 42 shows the average scale scores for NTS-3. The gaps remained consistent through both testing windows and both grade levels.

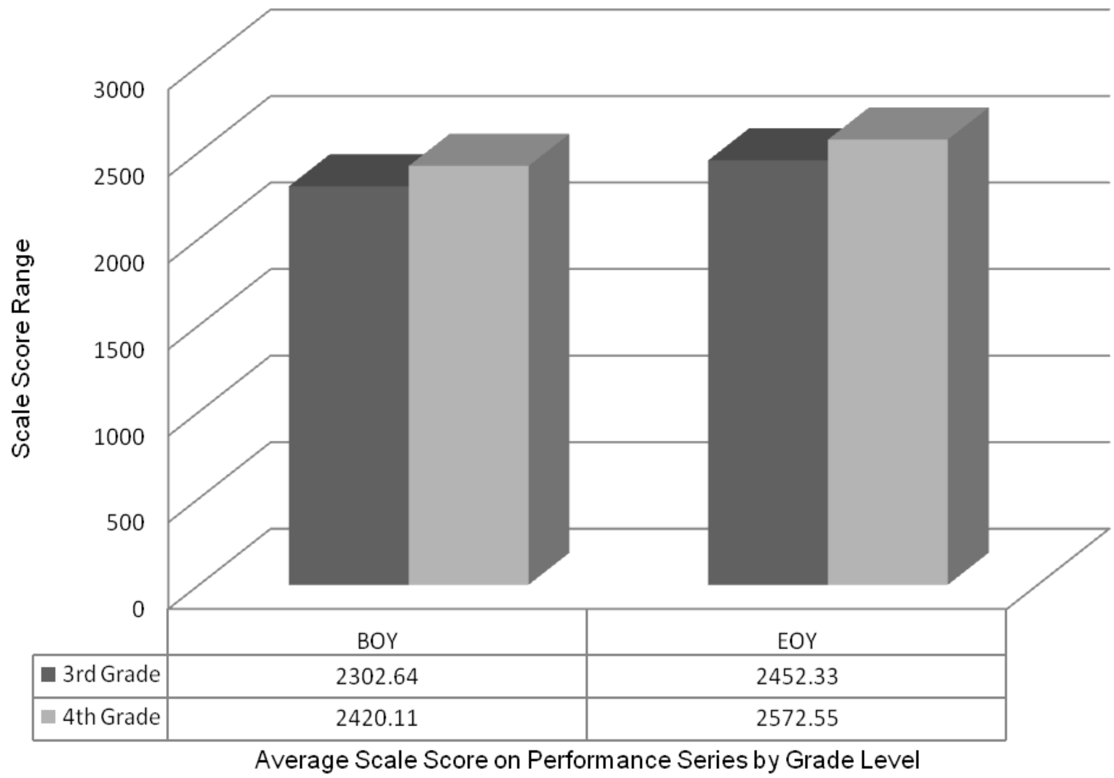


Figure 42. NTS-3 average scale score on 2009-2010 Performance Series test.

Non-Title School-2. NTS-2 did not implement the Performance Series test in 2008-2009 but had 248 students who took the Performance Series in 2009-2010. Figure 43 shows the average scale scores for NTS-2. NTS-2 serves only fifth grade students. Students from NTS-1 and NTS-3 both feed into NTS-2. The average scale score increased by 181 points.

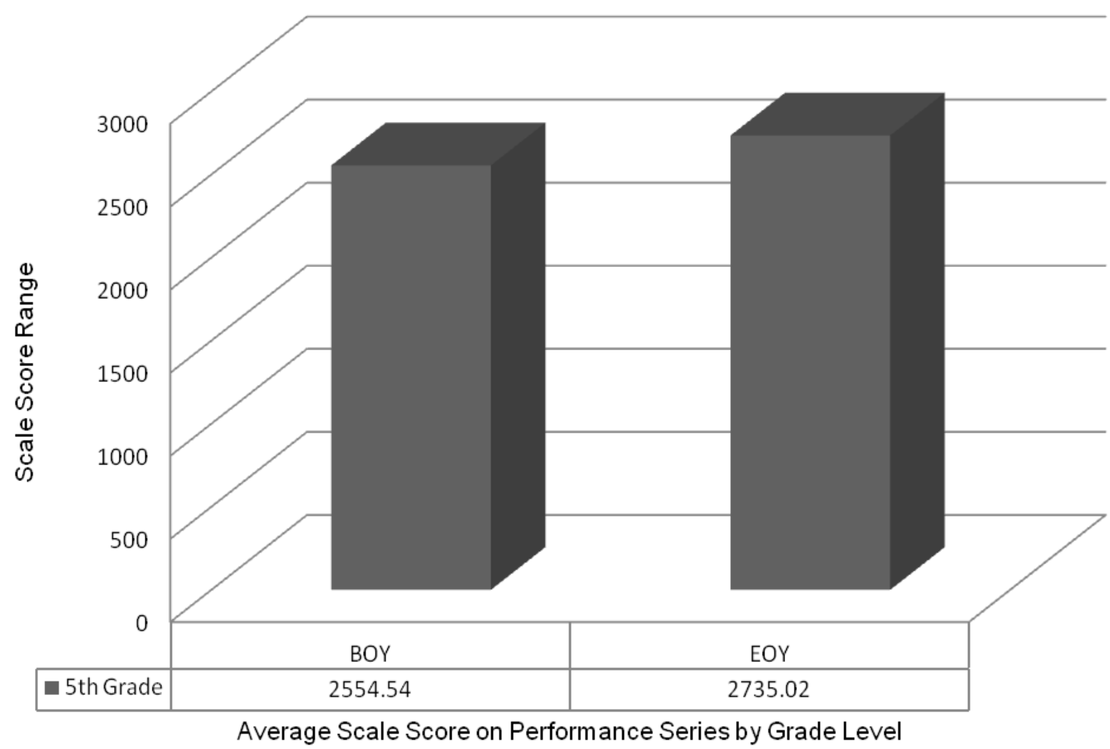


Figure 43. NTS-2 average scale score on 2009-2010 Performance Series test.

Non-Title School-1. NTS-1 did not implement the Performance Series test in 2008-2009 but had 193 students who took the Performance Series in 2009-2010. Figure 44 shows the average scale scores for NTS-1. NTS-1 only serves students in third and fourth grade, and when a student advances to fifth grade the student will attend NTS-2. The third grade average scale score grew at a greater pace than the fourth grade average scale score.

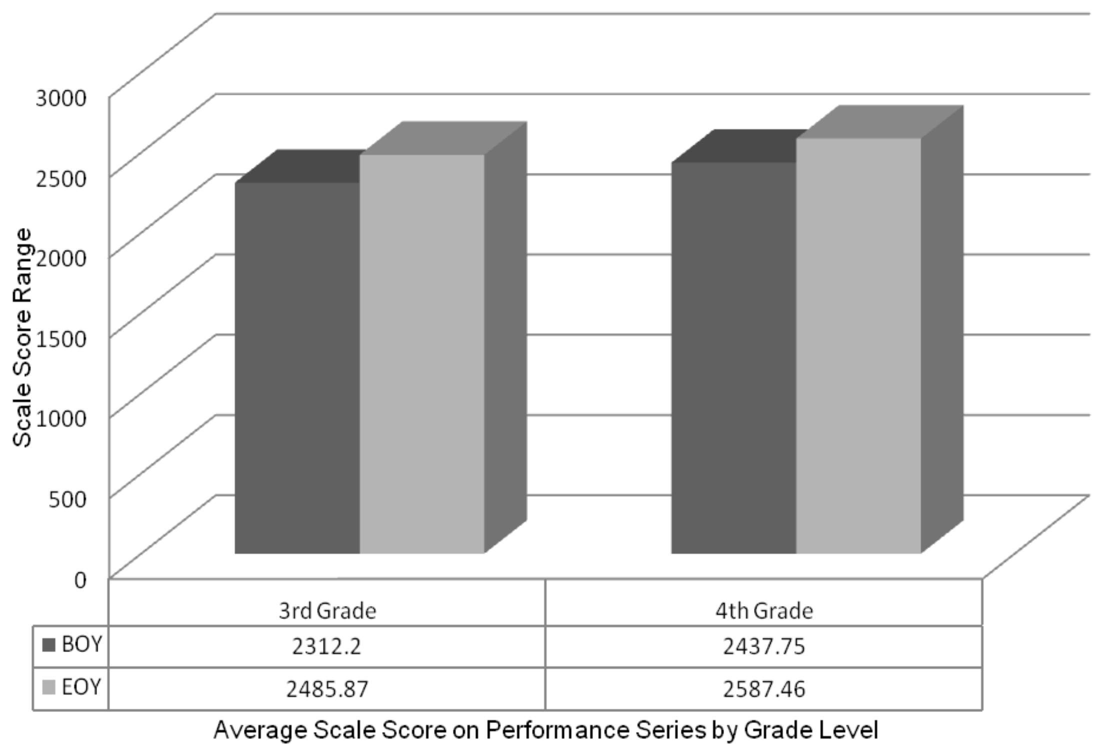


Figure 44. NTS-1 average scale score on 2009-2010 Performance Series test.

t-test. A *t*-test was applied to determine significance in the difference between scores for Title schools and Non-Title schools with the BOY and EOY scores for the 2008-2010 academic years (see Table 5). The alpha level identified for significance was : $p < \alpha$ .05 (Trochim, 2006d).In academic year 2008-2009, there were not enough data for significance in the study, due to the transition between STAR Math Test and Performance Series, and not every school took the Performance Series. The *t*-test was conducted where *t* equals the mean of the Non-Title schools, either BOY or EOY score for each year; minus the mean of the Title schools, either BOY or EOY score for each year; this total was then divided by the standard error of the difference of the means. The *t*-value was derived from this formula, then using a *t* distribution chart the numbers were found with the alpha level to determine a level of confidence. With the *t* values clustered together the same level of confidence was accepted for all tests. The exception was the 2008-2009 EOY scores which had a lower *t*-value level separating the level of confidence from the other scores.The alpha level for this study was set at 0.05.

Table 5

Level of Confidence for Performance Series between Title and Non-Title Schools

Test	*t* - value	Alpha Level	Level of Confidence
2008-2009 - BOY	13.75	0.05	1.76
2008-2009 - EOY	7.34	0.05	1.89
2009-2010 - BOY	20.65	0.05	1.73
2009-2010 - EOY	18.15	0.05	1.73

Statistical landmarks. The statisical landmarks in this study are presented in Table 6 to show the differences between the two groups. In the landmarks, there was a difference in starting points for the Non-Title and Title schools. There was also a difference in the average. To help make the comparisons in growth the average BOY and

EOY scores can be used to compare Title to Non-Title schools. The average growth between Non-Title and Title schools was in the 90-150 point range, however the BOY and EOY scores for the Non-Title schools were a higher average than those of the Title school.

Table 6

Statistical Landmarks for Performance Series BOY and EOY Grouped by Title Status

Academic Year	Test Period	Maximum	Minimum	Mean	Standard Deviation
2008-2009	BOY (NTS)	2838	2071	2465.55	172.71
2008-2009	EOY (NTS)	3007	1944	2545.82	213.69
2008-2009	BOY (TS)	2882	1663	2266.57	200.22
2008-2009	EOY (TS)	3146	1682	2423.37	206.58
2009-2010	BOY (NTS)	3032	1633	2432.85	184.70
2009-2010	EOY (NTS)	3181	1499	2584.07	201.80
2009-2010	BOY (TS)	2846	1565	2289.11	201.28
2009-2010	EOY (TS)	3238	1694	2449.58	208.77

Pearson r. A Pearson *r* was used to analyze the data for correlation. The correlation between the BOY and EOY scores for each academic year are presented in Table 7. All the years for Title and Non-Title Schools were found to have a high positive correlation.

Table 7

Correlation Factor of Performance Series BOY and EOY for Title and Non-Title Schools

School Year	Type of School	Correlation
2008-2009	Non-Title Schools	0.82
2008-2009	Title Schools	0.85
2009-2010	Non-Title Schools	0.83
2009-2010	Title Schools	0.85

Research Question Three

What difference of student scores exists within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%? The Performance Series data consisted of two academic years, 2008-2009 and 2009-2010. Academic year 2008-2009 was a transitional year between the previously used STAR Math test and the Performance Series, so only five of the 22 schools in this study had data represented. Due to the lack of data, 2008-2009 was not represented in the graphs. In academic year 2009-2010, 1636 Title students and 1428 Non-Title students were included in the study. Due to the alignment with state expectations, fourth grade was not scored in the data analysis strand on the Performance Series.

Number and operations 2009-2010. In Figures 45 and 46 student scores in number and operations are represented on the graph. In Figure 45 a larger range of student scores of the 15 Title schools is evident. In Figure 46 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Growth was compared in the previous questions, and the data were used to compare students' scores within the same mathematical strand.

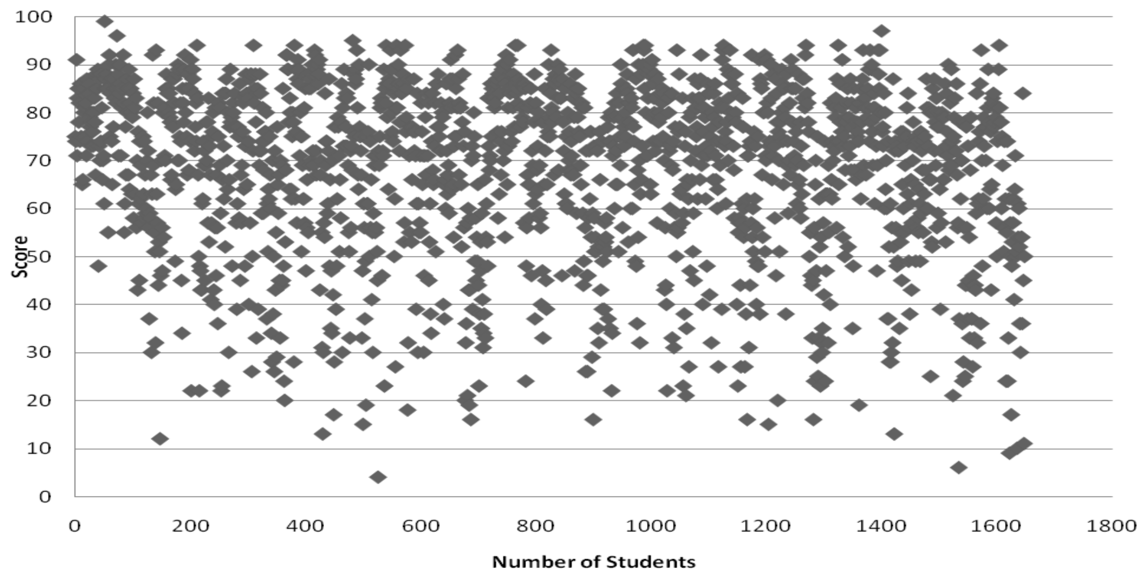


Figure 45. Title schools numbers and operations 2009 - 2010.
Each diamond represents a student's score.

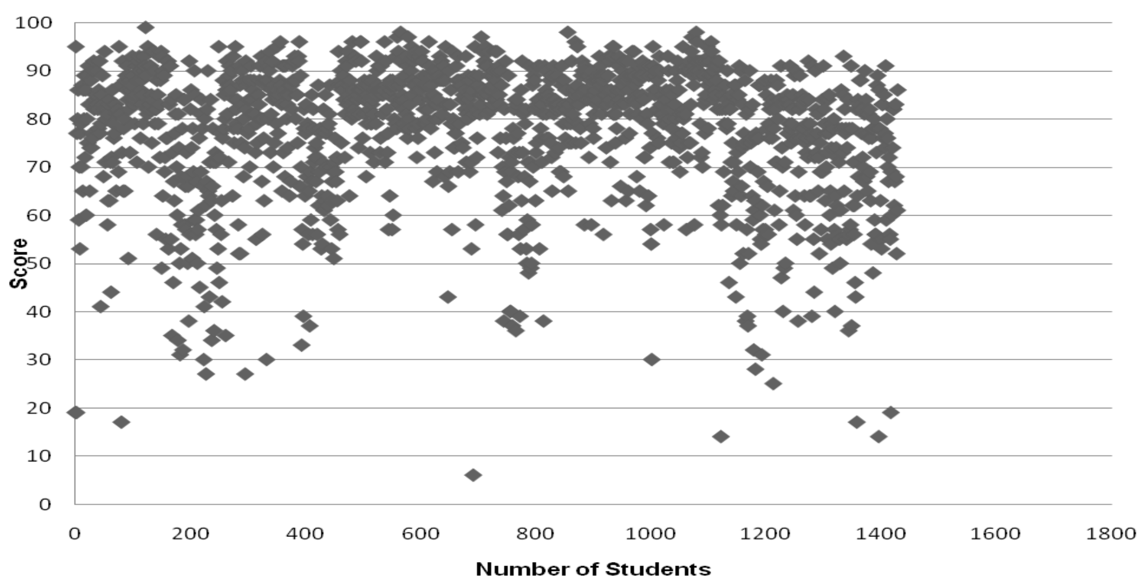


Figure 46. Non-Title schools numbers and operations 2009 - 2010.
Each diamond represents a student's score.

Algebraic relationships 2009-2010. In Figures 47 and 48 student scores in algebraic relations are represented on the graph. In Figure 47 a larger range of student scores of the 15 Title schools is evident. In Figure 48 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Growth was compared in the previous questions, and the data were used to compare students' scores within the same mathematical strand.

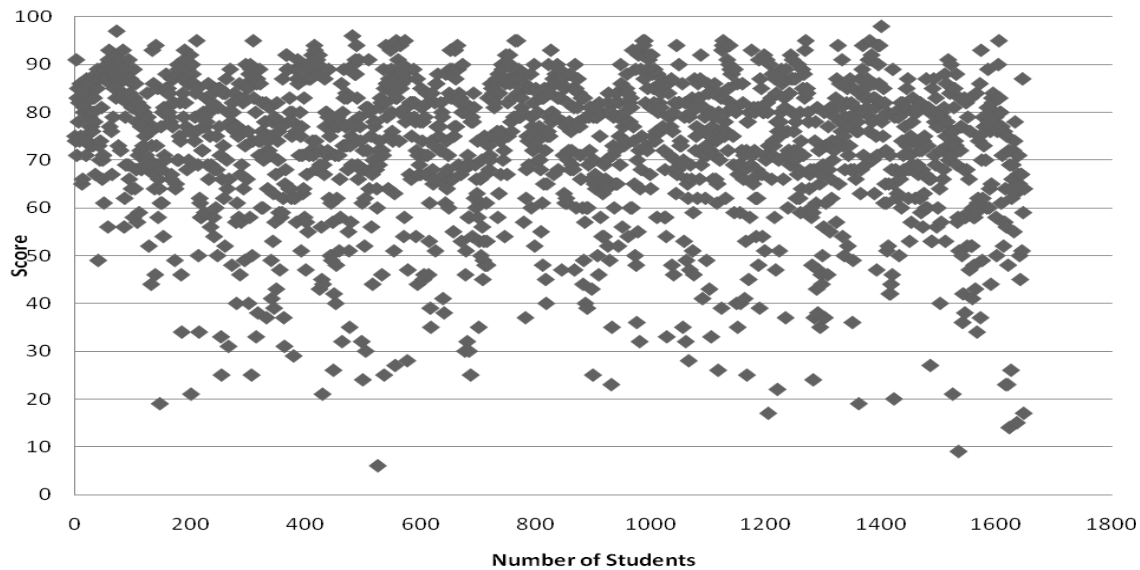


Figure 47. Title schools algebraic relationships 2009 - 2010.
Each diamond represents a student's score.

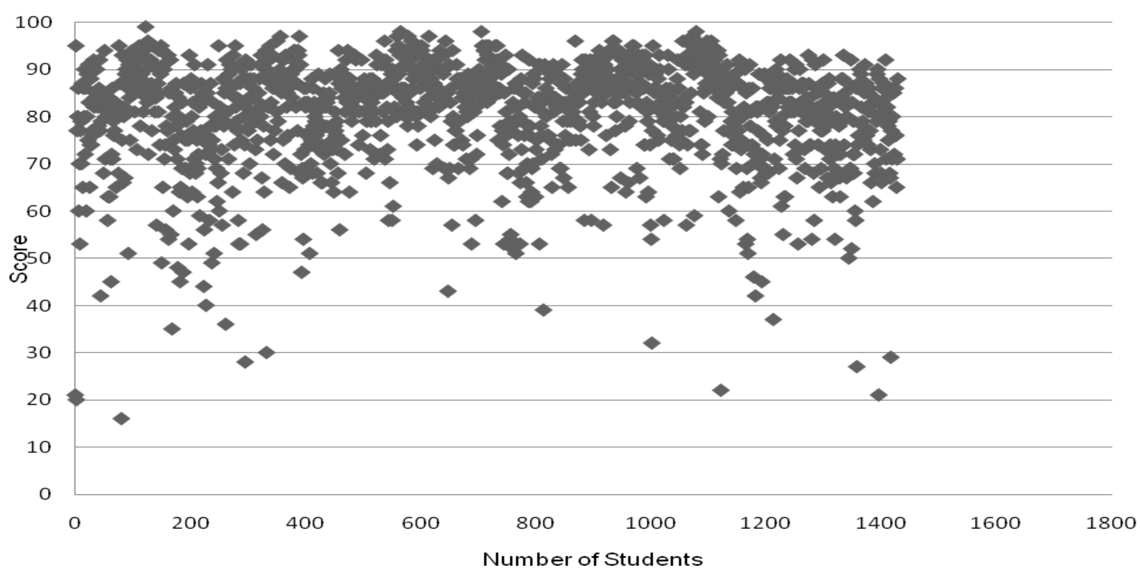


Figure 48. Non-Title Schools algebraic relationships 2009 - 2010.
Each diamond represents a student's score.

Geometric and spatial relationships 2009-2010. In Figures 49 and 50 student scores in geometric and spatial relationships are represented on the graph. In Figure 49 a larger range of student scores of the 15 Title schools is evident. In Figure 50 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Growth was compared in the previous questions, and the data were used to compare students' scores within the same mathematical strand.

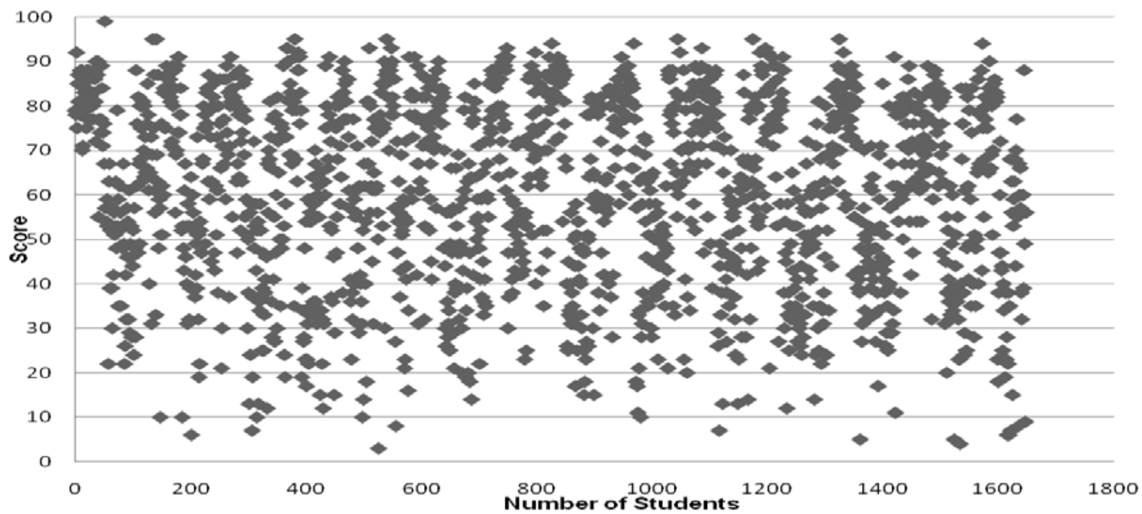


Figure 49. Title schools geometric and spatial relationships 2009 - 2010.
Each diamond represents a student's score.

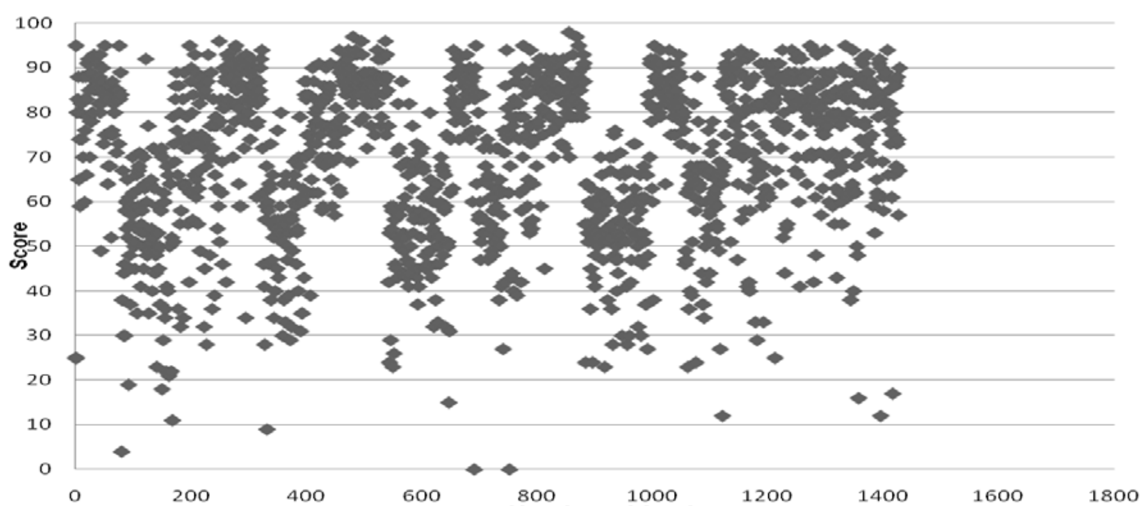


Figure 50. Non-Title schools geometric and spatial relationships 2009 - 2010.
Each diamond represents a student's score.

Measurement 2009-2010. In Figures 51 and 52 student scores in measurement are represented on the graph. In Figure 51 a larger range of student scores of the 15 Title schools is evident. In Figure 52 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Growth was compared in the previous questions, and the data were used to compare students' scores within the same mathematical strand.

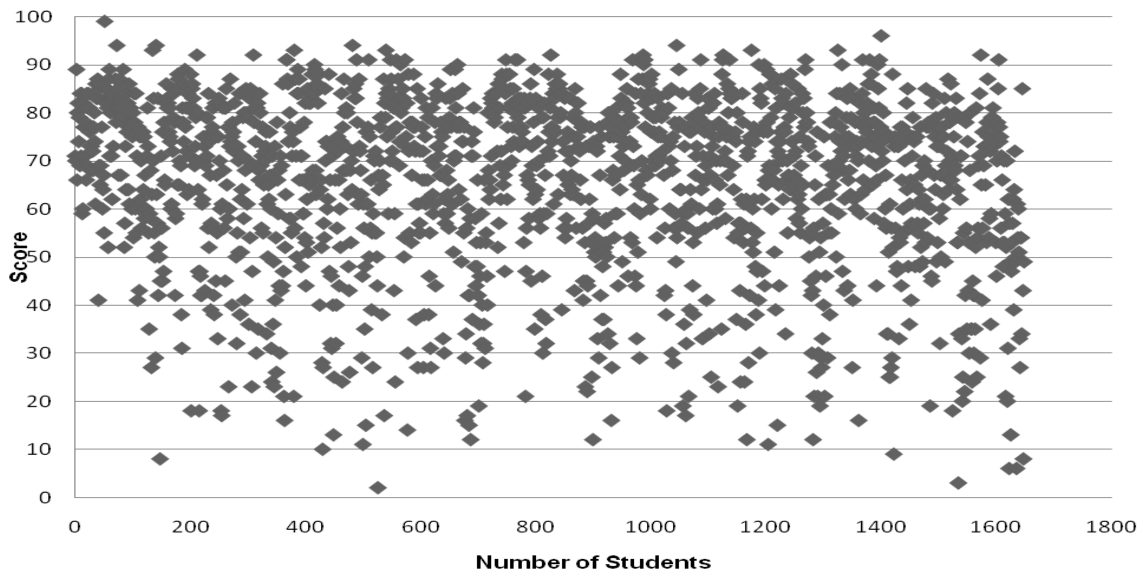


Figure 51. Title schools measurement 2009 - 2010.
Each diamond represents a student's score.

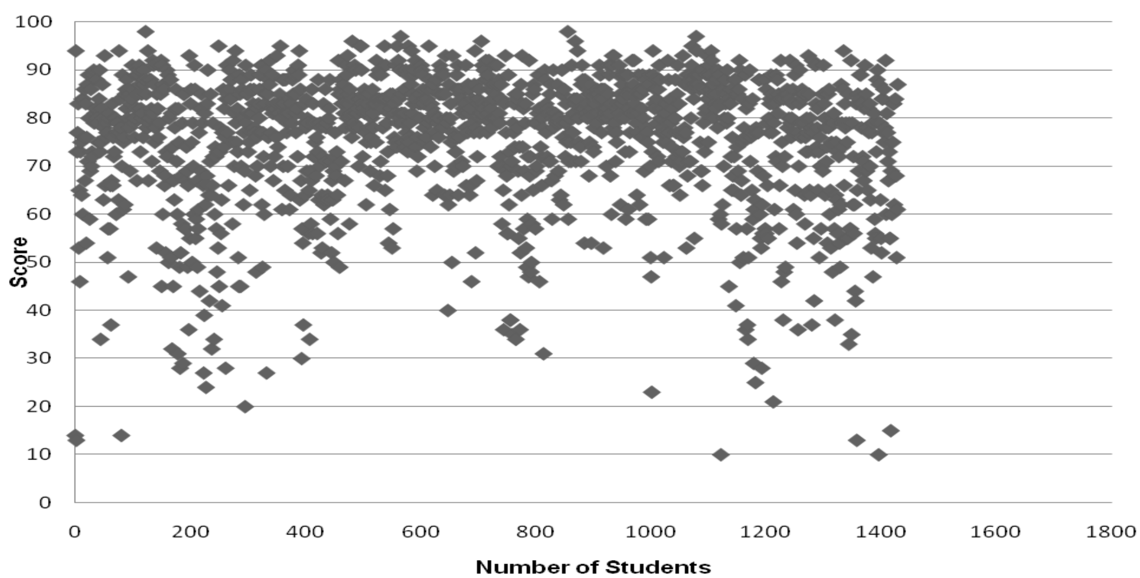


Figure 52. Non-Title schools measurement 2009 - 2010.
Each diamond represents a student's score.

Data and probability 2009-2010. In Figures 53 and 54 student scores in number and operations are represented on the graph. In Figure 53 a larger range of student scores of the 15 Title schools is evident. In Figure 54 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Growth was compared in the previous questions, and the data were used to compare students' scores within the same mathematical strand.

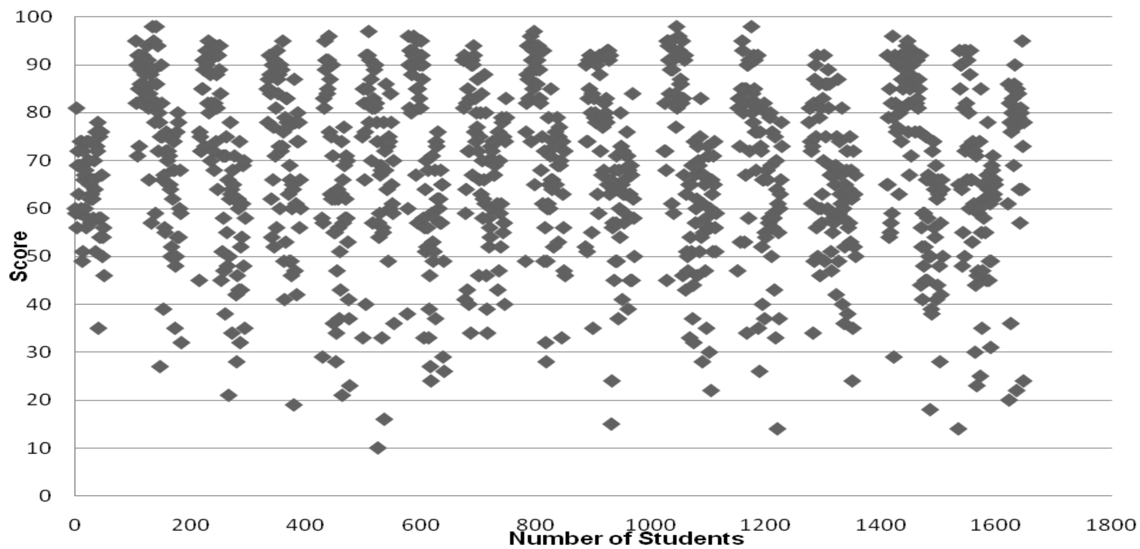


Figure 53. Title schools data and probability 2009 - 2010.
Each diamond represents a student's score.

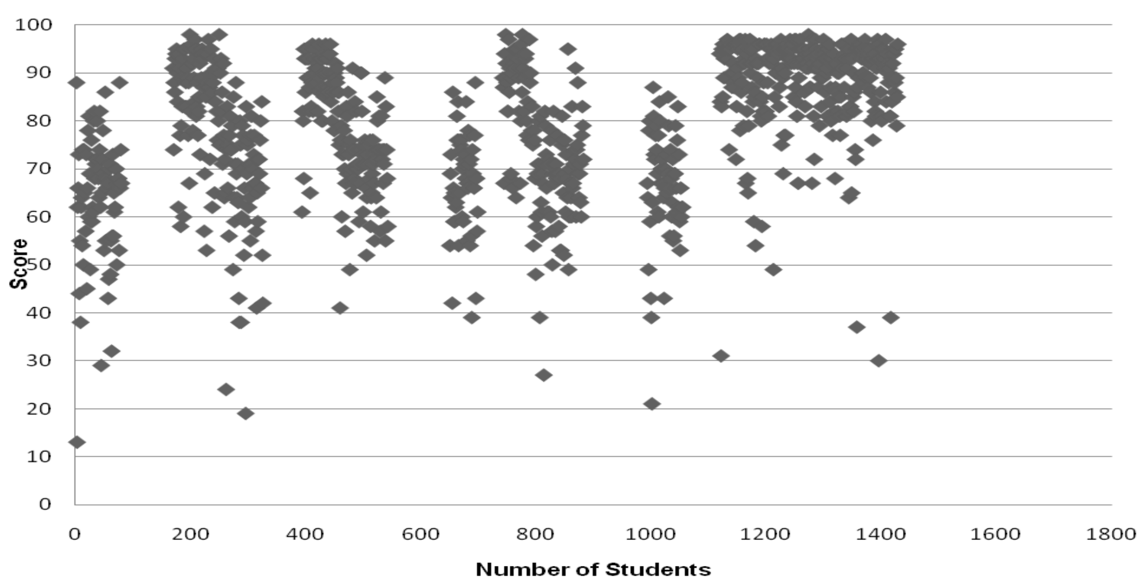


Figure 54. Non-Title schools data and probability 2009 - 2010.
Each diamond represents a student's score.

***t*-test.** A *t*-test was applied to determine significance in the difference between scores for Title schools and Non-Title schools in Performance Series Math test content strand scores for the 2008-2010 academic years (see Table 8). The alpha level identified for significance was: $p < \alpha$ .05 (Trochim, 2006d). The *t*-test was conducted where *t* equals the mean of the Non-Title schools' content strand score for each academic year; minus the mean of the Title schools' content strand score for each year. This total was then divided by the standard error of the difference of the means. The *t*-value was derived from this formula, then using a *t* distribution chart the numbers were found with the alpha level to determine a level of confidence. In research questions one and two, BOY and EOY scores were compared. Research questions three and four compared the schools scores within the content area. This resulted in a larger range of confidence levels. The alpha level for this study was set at 0.05.

Table 8

Level of Confidence for Performance Series Math Test between Title and Non-Title Schools Divided by Content Strand

Test	*t* - value	Alpha Level	Level of Confidence
2008-2009 Number and Operations	8.15	0.05	2.30
2008-2009 Algebra	8.06	0.05	2.30
2008-2009 Geometry	7.97	0.05	2.30
2008-2009 Measurement	8.43	0.05	2.30
2008-2009 Data and Probability	4.37	0.05	2.78
2009-2010 Number and Operations	16.03	0.05	2.12
2009-2010 Algebra	17.79	0.05	2.10
2009-2010 Geometry	13.62	0.05	2.15
2009-2010 Measurement	17.53	0.05	2.10
2009-2010 Data and Probability	13.79	0.05	2.15

Statistical landmarks. The statisical landmarks in this study are presented in Table 9 to show the differences between the two groups. In the landmarks, maximum and minimum are used to compare highs and lows within a group. Mean will compare the group average, and standard deviation will show how the groups break away from the distribution curve. To help make the comparisons in achievement the Title to Non-Title schools average students' scores in each of the content strands can be analyzed. The average achievement scores between Non-Title and Title schools were in the 8-10 point range. The difference in achievement between the Non-Title and Title schools is evidence of the gap between the two type of schools. The larger gaps represent areas of greater concern.

Table 9

Statistical Landmarks for Performance Series Grouped by Year and Content Strand

Academic Year by Test Strand	Maximum	Minimum	Mean	Standard Deviation
2008-2009 Number and Operations (TS)	98	13	65.19	18.79
2008-2009 Number and Operations (NTS)	96	11	75.86	15.20
2008-2009 Algebra (TS)	95	16	69.42	16.21
2008-2009 Algebra (NTS)	95	17	78.61	13.28
2008-2009 Geometry (TS)	92	10	56.09	21.15
2008-2009 Geometry (NTS)	96	9	68.29	18.37
2008-2009 Measurement (TS)	98	9	62.22	19.02
2008-2009 Measurement (NTS)	95	8	73.52	15.63
2008-2009 Data and Probability (TS)	97	19	66.40	17.14
2008-2009 Data and Probability (NTS)	97	25	74.05	18.2
2009-2010 Number and Operations (TS)	99	4	68.02	17.87
2009-2010 Number and Operations (NTS)	99	6	77.29	14.10
2009-2010 Algebra (TS)	98	6	71.88	15.36
2009-2010 Algebra (NTS)	99	16	80.42	11.45
2009-2010 Geometry (TS)	99	3	60.51	20.99
2009-2010 Geometry (NTS)	98	4	70.00	17.78
2009-2010 Measurement (TS)	99	2	65.20	18.17
2009-2010 Measurement (NTS)	98	10	75.37	14.10
2009-2010 Data and Probability (TS)	98	10	68.50	17.55
2009-2010 Data and Probability (NTS)	98	13	78.29	14.68

Pearson r. A Pearson *r* was used to analyze the data for correlation. The correlation between the Title and Non-Title schools Performance Series content strand scores for each academic year are presented in Table 10. When comparing the scores of Title and Non-Title schools a small correlation, both positive and negative were found between the achievement scores of the two divisions of schools.

Table 10

Correlation Factor of Performance Series Math Test for Content Strands

School Year	Content Strand	Correlation
2008-2009	Number and Operations	0.07
2008-2009	Algebra	-0.01
2008-2009	Geometry	-0.13
2008-2009	Measurement	0.02
2008-2009	Data and Probability	-0.02
2009-2010	Number and Operations	-0.01
2009-2010	Algebra	-0.02
2009-2010	Geometry	-0.06
2009-2010	Measurement	-0.01
2009-2010	Data and Probability	0.03

Research Question Four

What difference of student scores exists within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%? The largest set of data was retrieved from the MAP test. It has been given consistently since 2005-2006 to the third through fifth grade levels. All 22 of the schools were represented in data for each year:

- 2005-2006
  - 1496 Non-Title Students
  - 1811 Title Students
- 2006-2007
  - 1463 Non-Title Students
  - 1780 Title Students
- 2007-2008
  - 1516 Non-Title Students
  - 1806 Title Students
- 2008-2009
  - 1528 Non-Title Students
  - 1845 Title Students
- 2009-2010
  - 1426 Non-Title Students
  - 1773 Title Students

In academic year 2009-2010 the third grade students did not receive a score in the data analysis strand. However, the fourth and fifth grade student scores provided ample data to make a comparison. The data were divided into Title and Non-Title schools by year. The figures which represented the data were presented by content strand and year with Title and Non-Title schools on the same page so the two could be compared.

Number and operations 2005-2006. In Figures 55 and 56 student scores in number and operations for academic year 2005-2006 are represented on the graph. In Figure 55 a larger range of student scores of the 15 Title schools is evident. In Figure 56 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

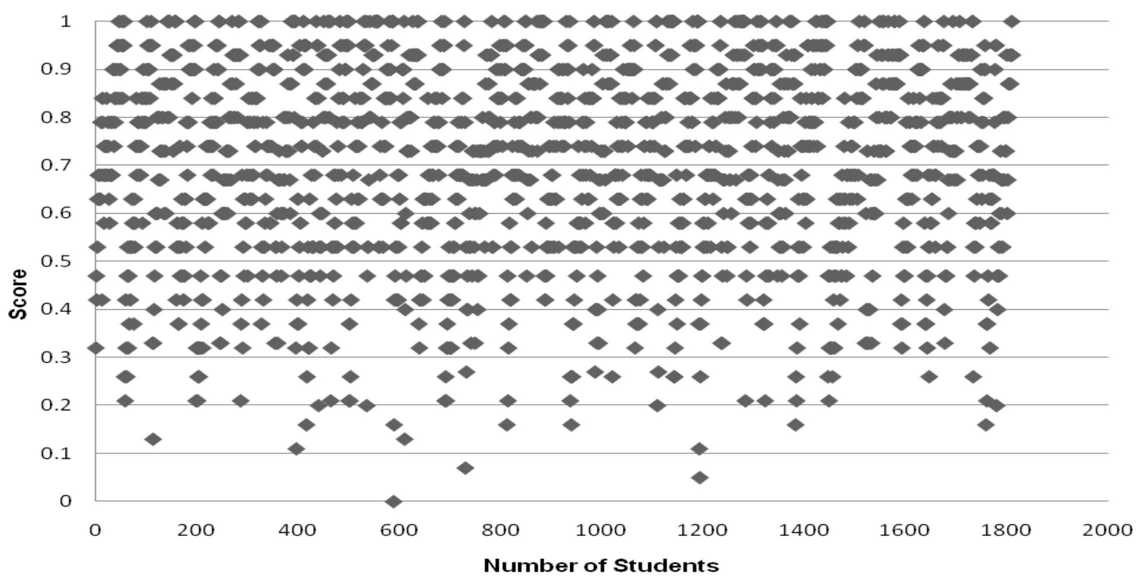


Figure 55. Title schools number and operations 2005 - 2006.
Each diamond represents a student's score.

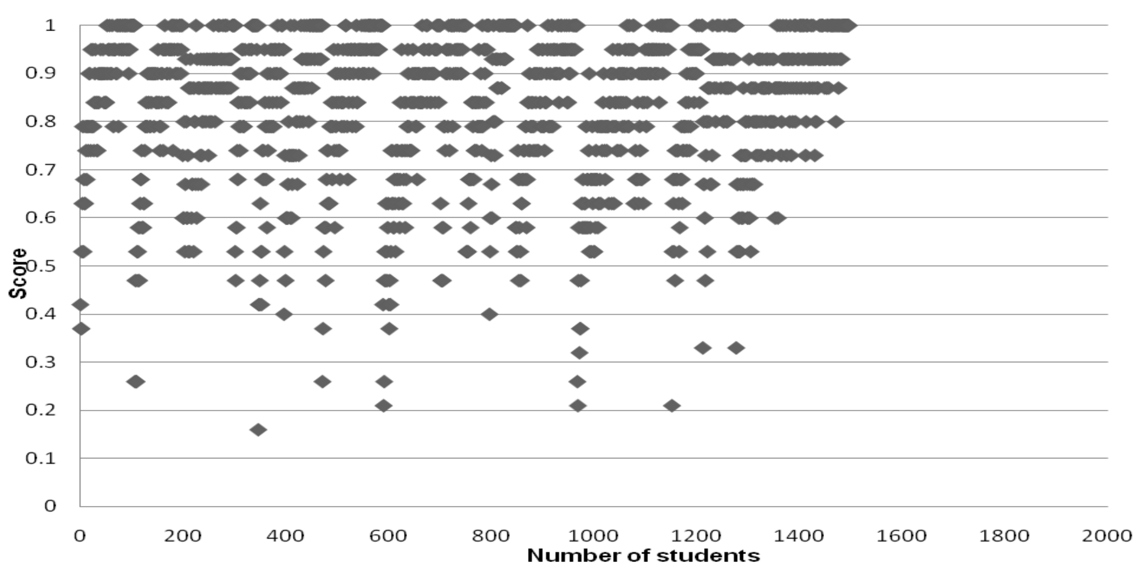


Figure 56. Non-Title schools number and operations 2005 - 2006.
Each diamond represents a student's score.

Number and operations 2006-2007. In Figures 57 and 58 student scores in number and operations for academic year 2006-2007 are represented on the graph. In Figure 57 a larger range of student scores of the 15 Title schools is evident. In Figure 58 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

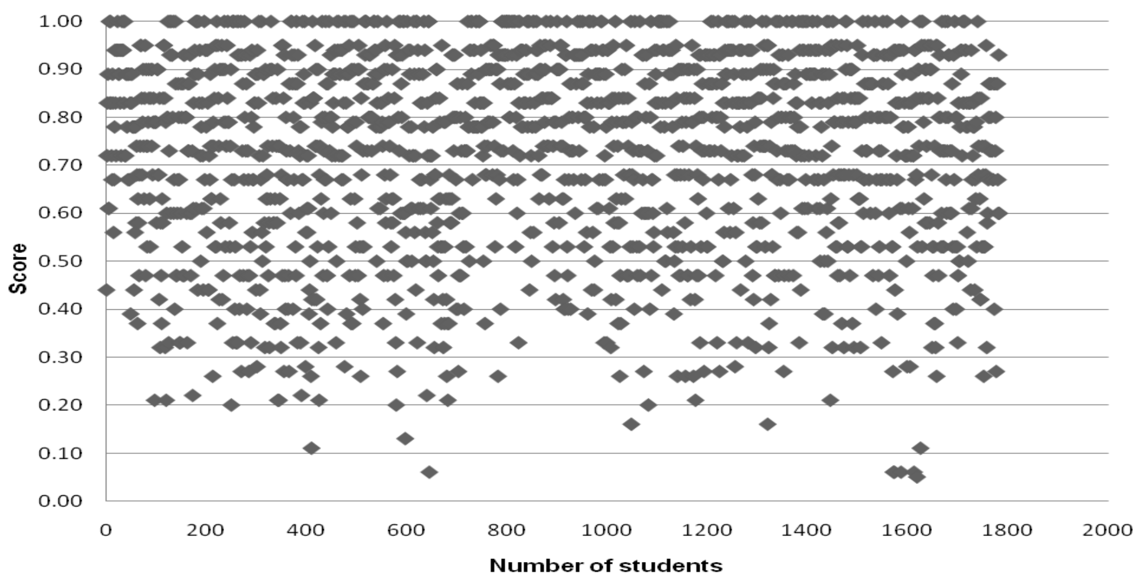


Figure 57. Title schools number and operations 2006 - 2007.
Each diamond represents a student's score.

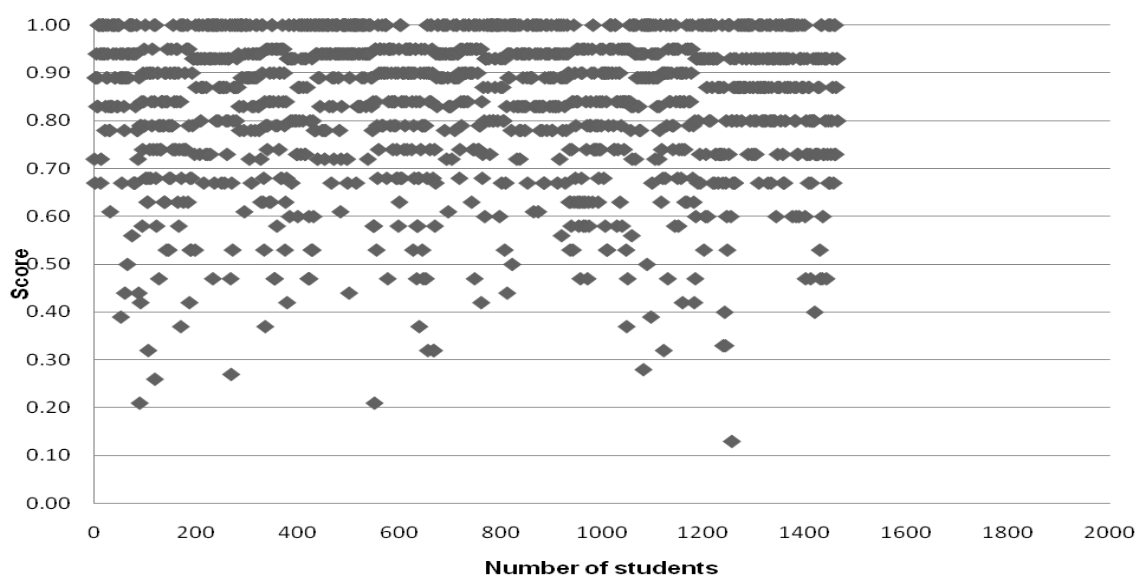


Figure 58. Non-Title schools number and operations 2006 - 2007.
Each diamond represents a student's score.

Number and operations 2007-2008. In Figures 59 and 60 student scores in number and operations for academic year 2007-2008 are represented on the graph. In Figure 59 a larger range of student scores of the 15 Title schools is evident. In Figure 60 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

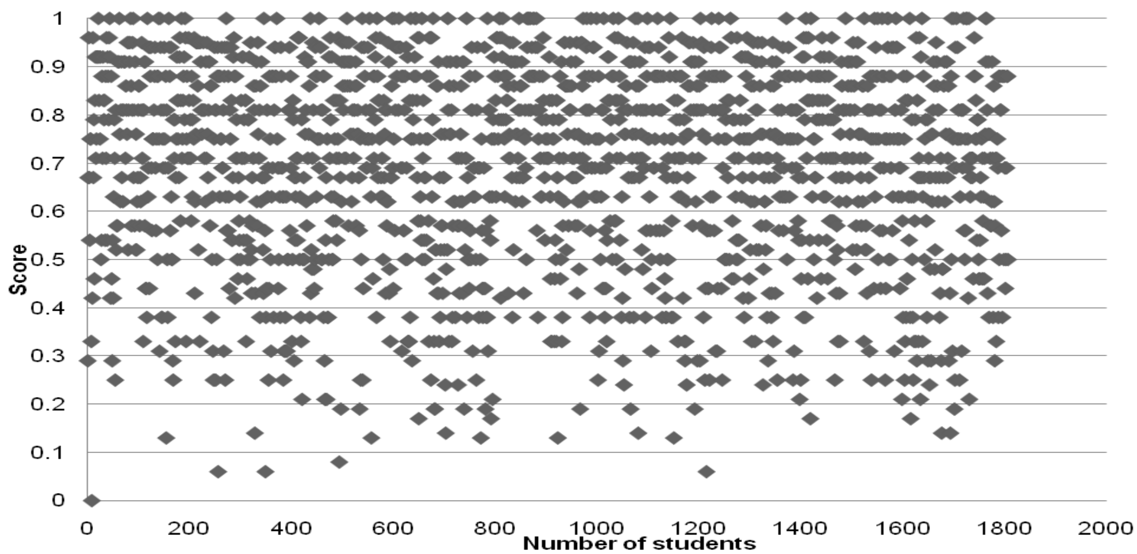


Figure 59. Title schools number and operations 2007 - 2008.
Each diamond represents a student's score.

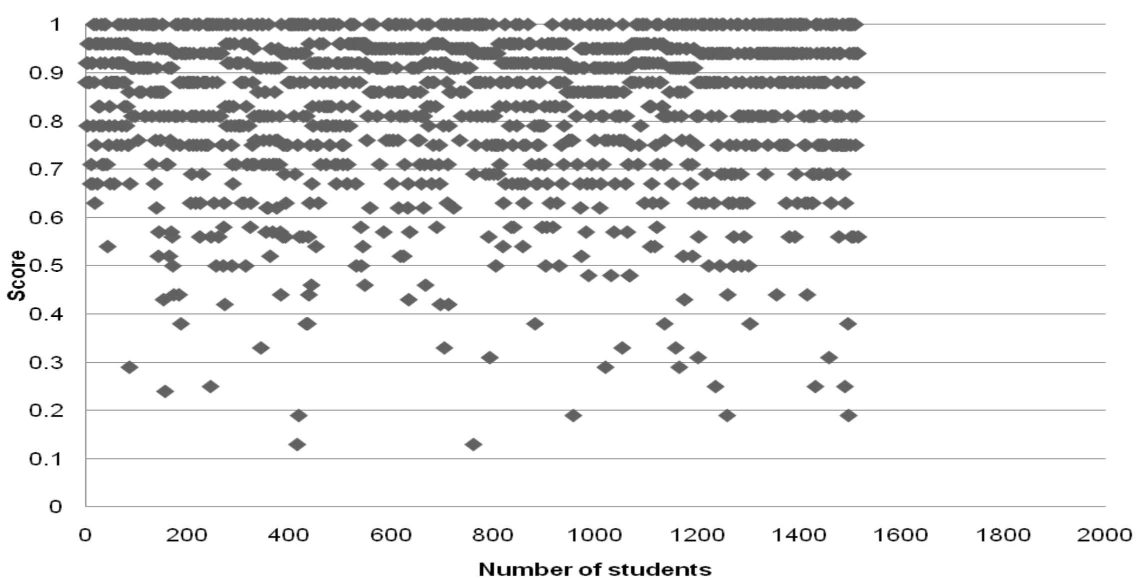


Figure 60. Non-Title schools number and operations 2007 - 2008.
Each diamond represents a student's score.

Number and operations 2008-2009. In Figures 61 and 62 student scores in number and operations for academic year 2008-2009 are represented on the graph. In Figure 61 a larger range of student scores of the 15 Title schools is evident. In Figure 62 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

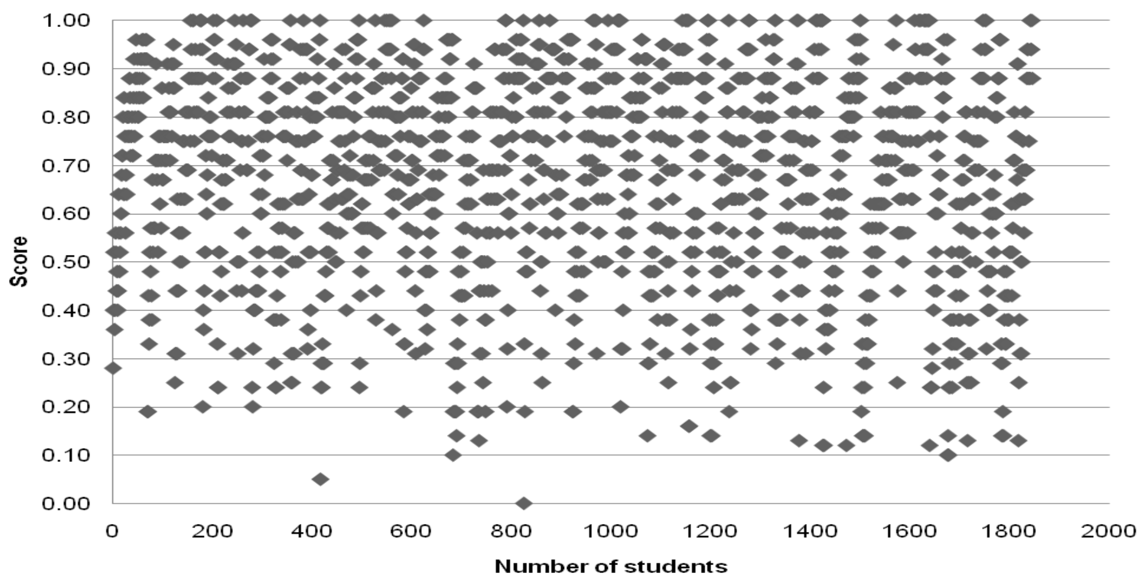


Figure 61. Title schools number and operations 2008 - 2009.
Each diamond represents a student's score.

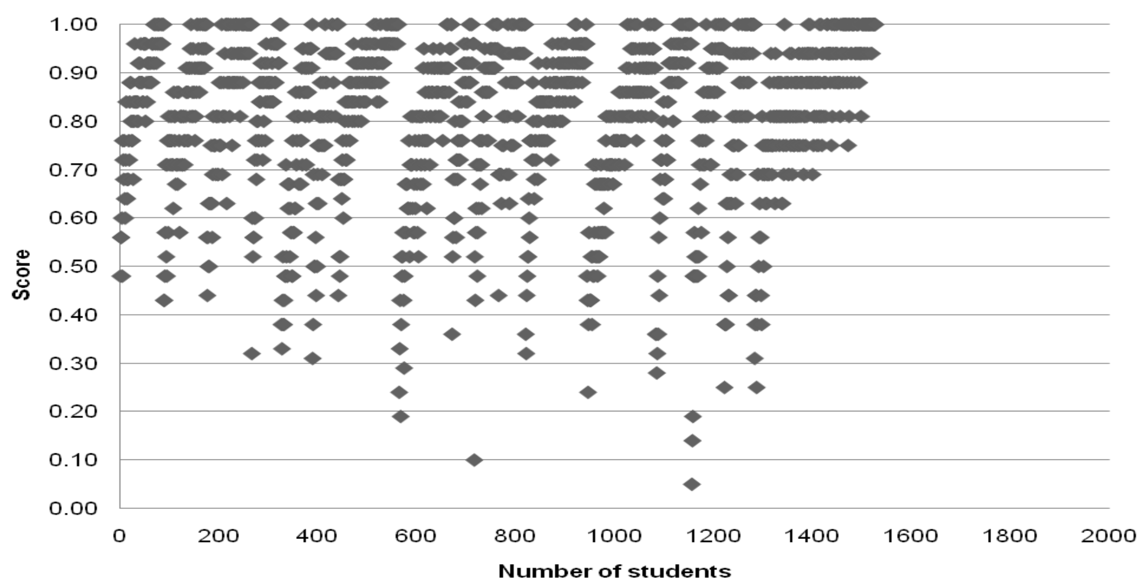


Figure 62. Non-Title schools number and operations 2008 - 2009.
Each diamond represents a student's score.

Number and operations 2009-2010. In Figures 63 and 64 student scores in number and operations for academic year 2009-2010 are represented on the graph. In Figure 63 a larger range of student scores of the 15 Title schools is evident. In Figure 64 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

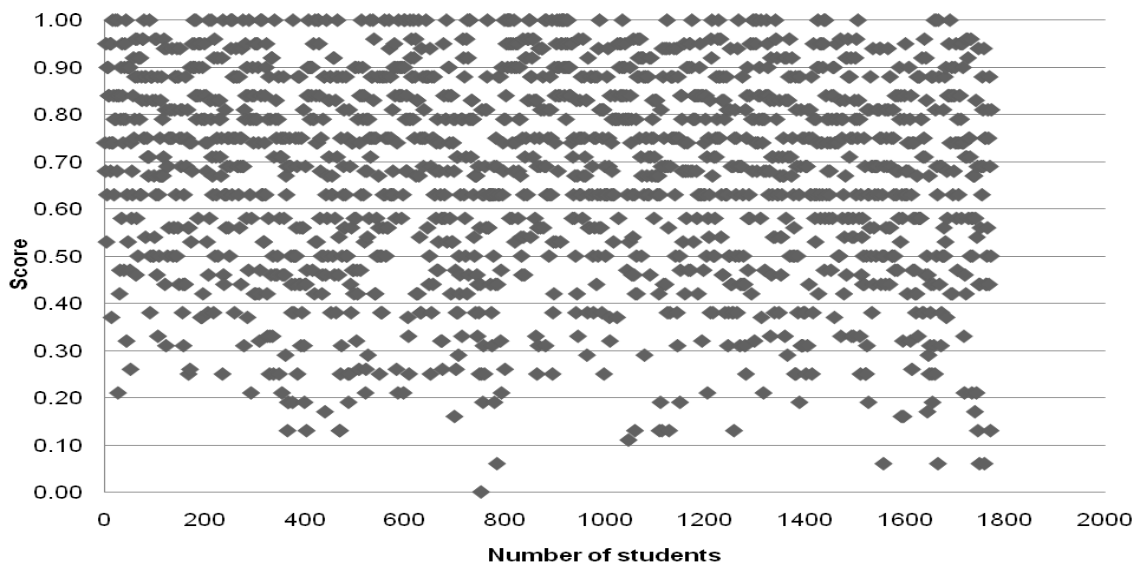


Figure 63. Title schools number and operations 2009 - 2010.
Each diamond represents a student's score.

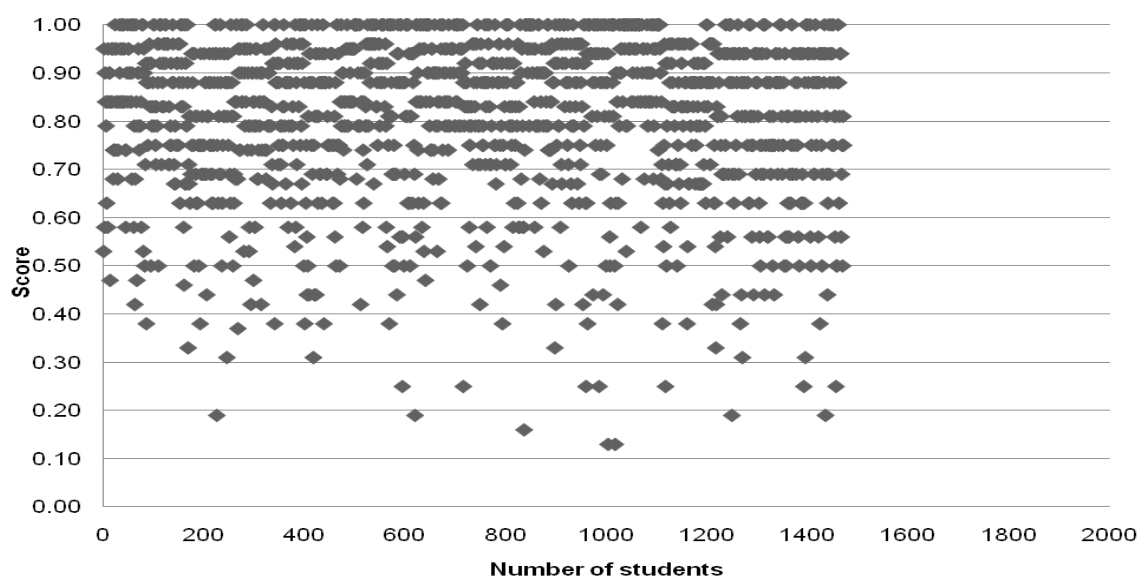


Figure 64. Non-Title schools number and operations 2009 - 2010.
Each diamond represents a student's score.

Algebraic relationships 2005-2006. In Figures 65 and 66 student scores in algebraic relationships for academic year 2005-2006 are represented on the graph. In Figure 65 a larger range of student scores of the 15 Title schools is evident. In Figure 66 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

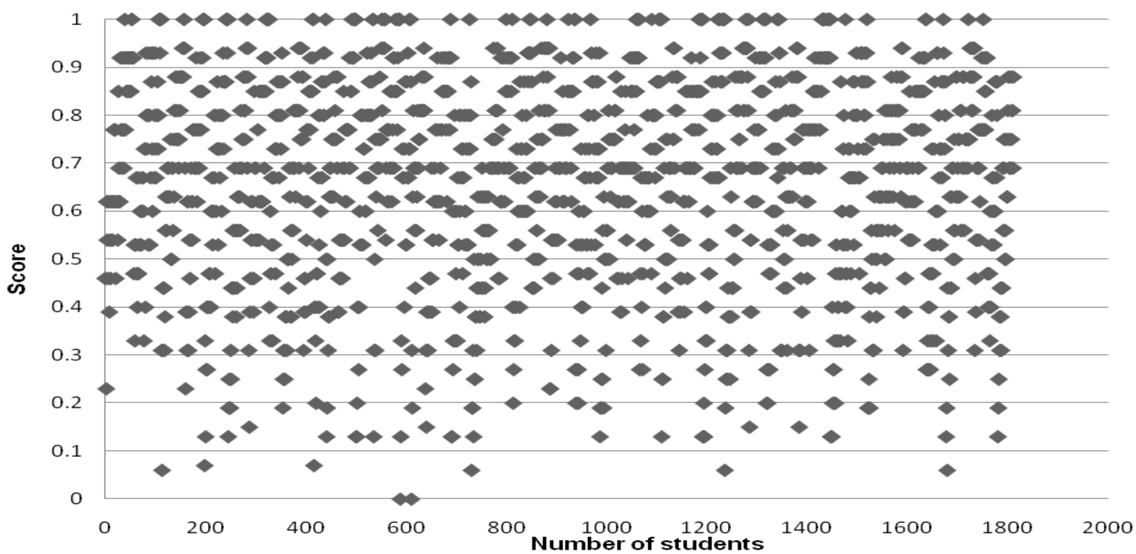


Figure 65. Title schools algebraic relationships 2005 - 2006.
Each diamond represents a student's score.

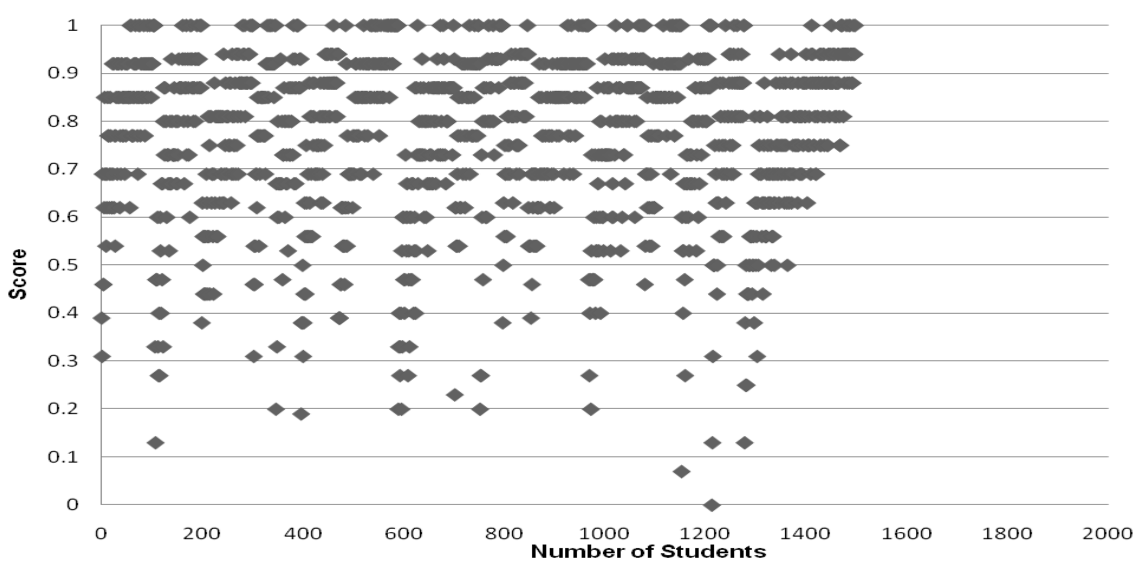


Figure 66. Non-Title schools algebraic relationships 2005 - 2006.
Each diamond represents a student's score.

Algebraic relationships 2006-2007. In Figures 67 and 68 student scores in algebraic relationships for academic year 2006-2007 are represented on the graph. In Figure 67 a larger range of student scores of the 15 Title schools is evident. In Figure 68 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

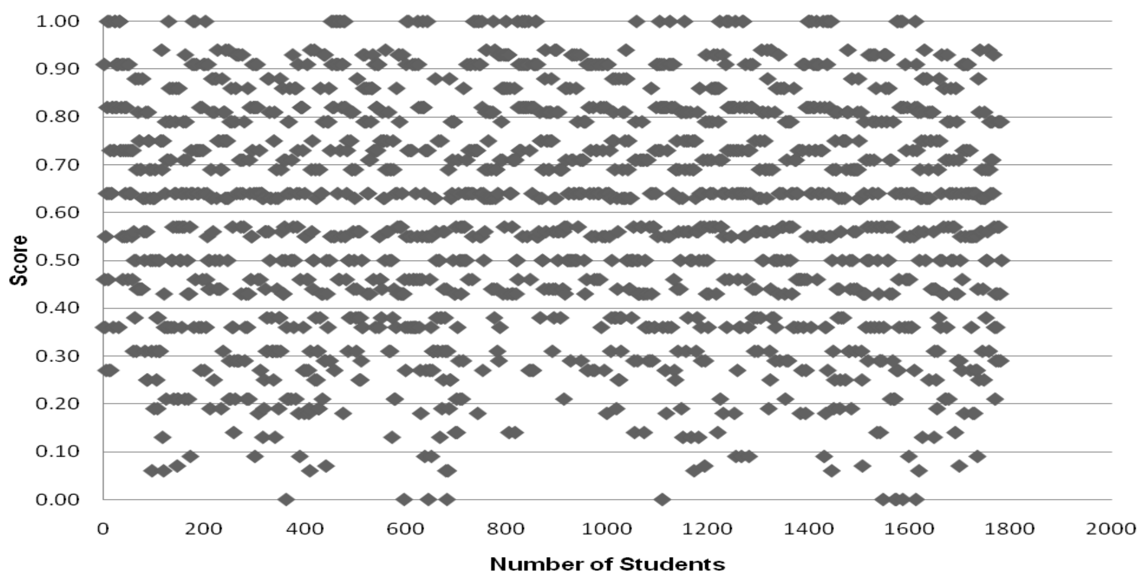


Figure 67. Title schools algebraic relationships 2006-2007.
Each diamond represents a student's score.

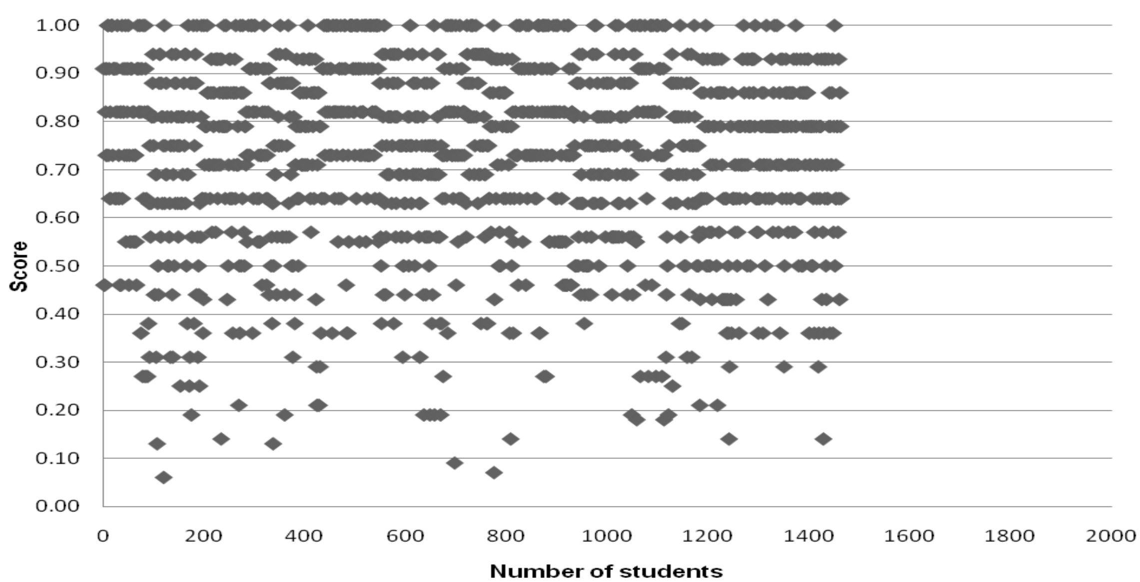


Figure 68. Non-Title schools algebraic relationships 2006-2007.
Each diamond represents a student's score.

Algebraic relationships 2007-2008. In Figures 69 and 70 student scores in algebraic relationships for academic year 2007-2008 are represented on the graph. In Figure 69 a larger range of student scores of the 15 Title schools is evident. In Figure 70 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

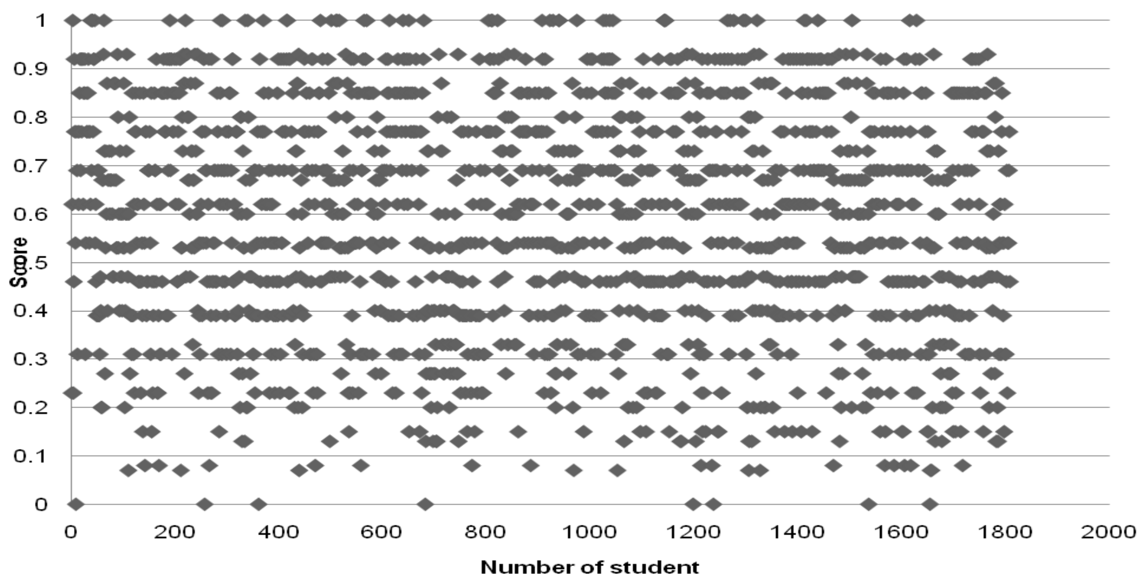


Figure 69. Title schools algebraic relationships 2007 - 2008.
Each diamond represents a student's score.

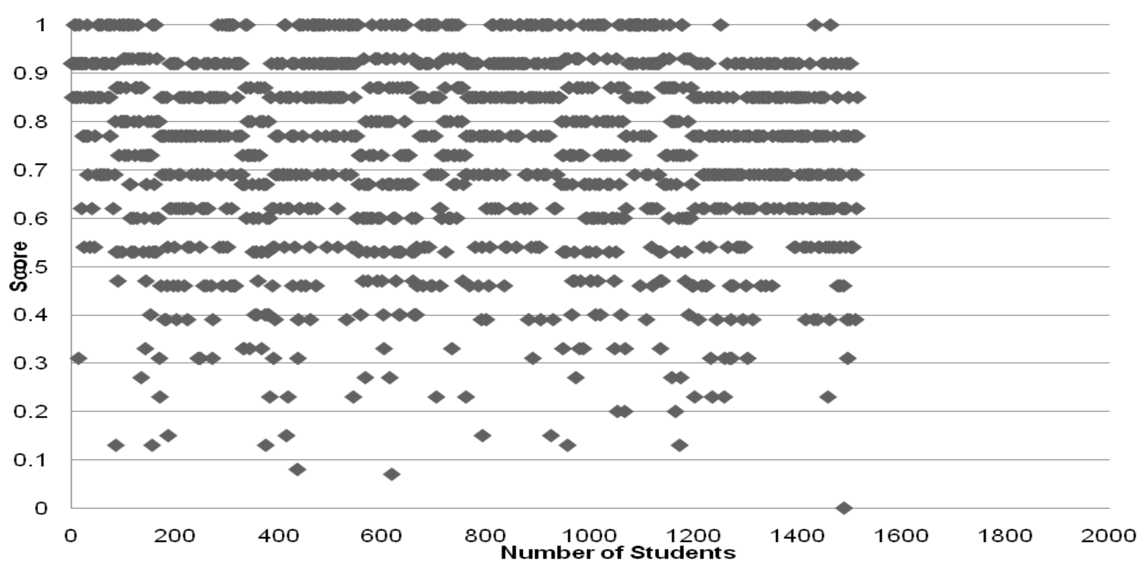


Figure 70. Non-Title schools algebraic relationships 2007 - 2008.
Each diamond represents a student's score.

Algebraic relationships 2008-2009. In Figures 71 and 72 student scores in algebraic relationships for academic year 2008-2009 are represented on the graph. In Figure 71 a larger range of student scores of the 15 Title schools is evident. In Figure 72 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

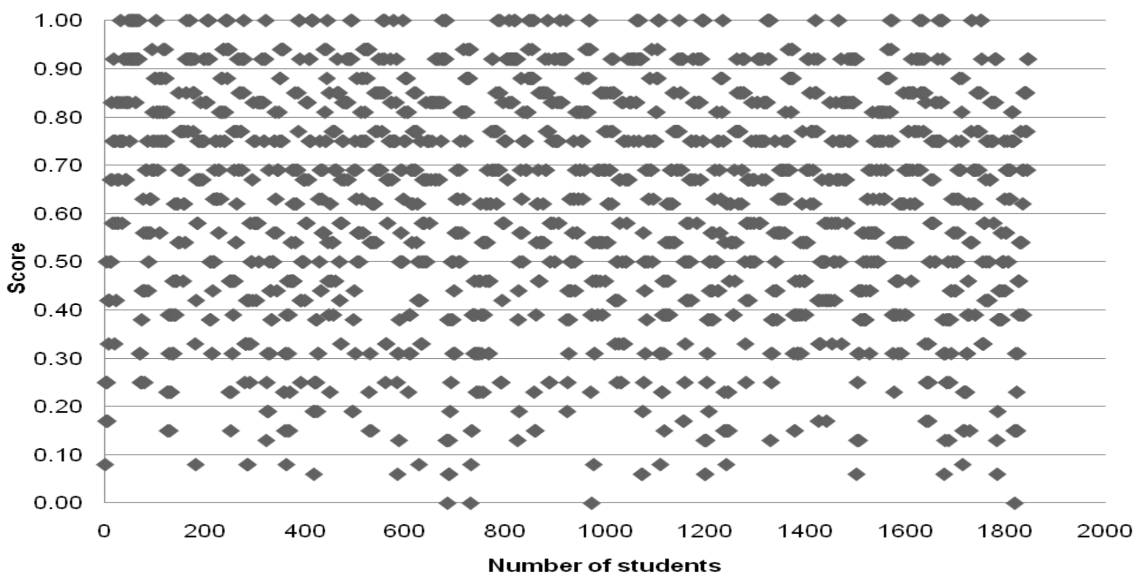


Figure 71. Title schools algebraic relationships 2008 - 2009.
Each diamond represents a student's score.

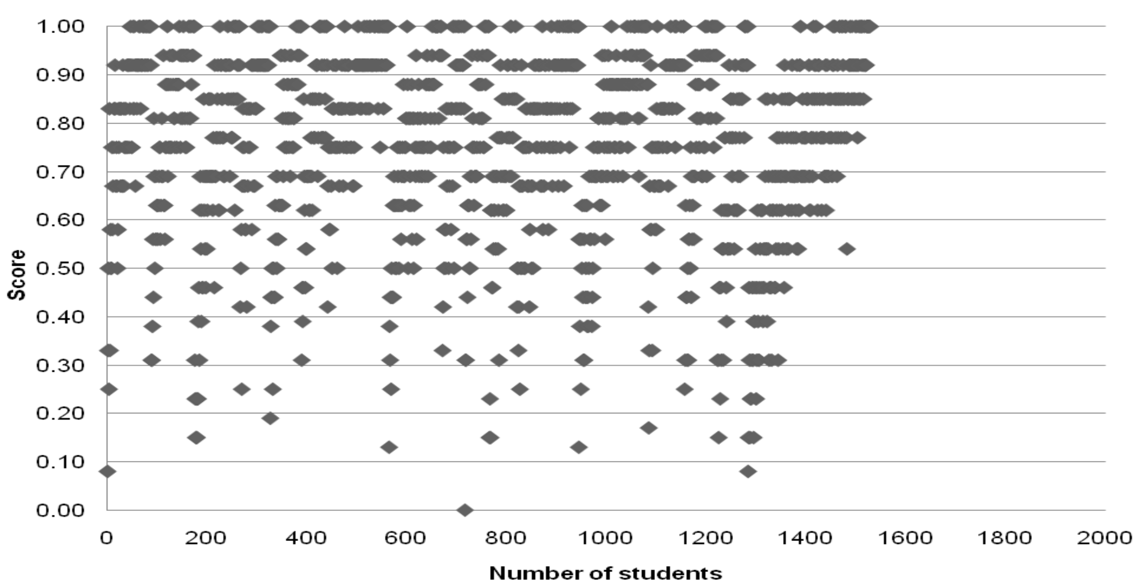


Figure 72. Non-Title schools algebraic relationships 2008 - 2009.
Each diamond represents a student's score.

Algebraic relationships 2009-2010. In Figures 73 and 74 student scores in algebraic relationships for academic year 2009-2010 are represented on the graph. In Figure 73 a larger range of student scores of the 15 Title schools is evident. In Figure 74 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

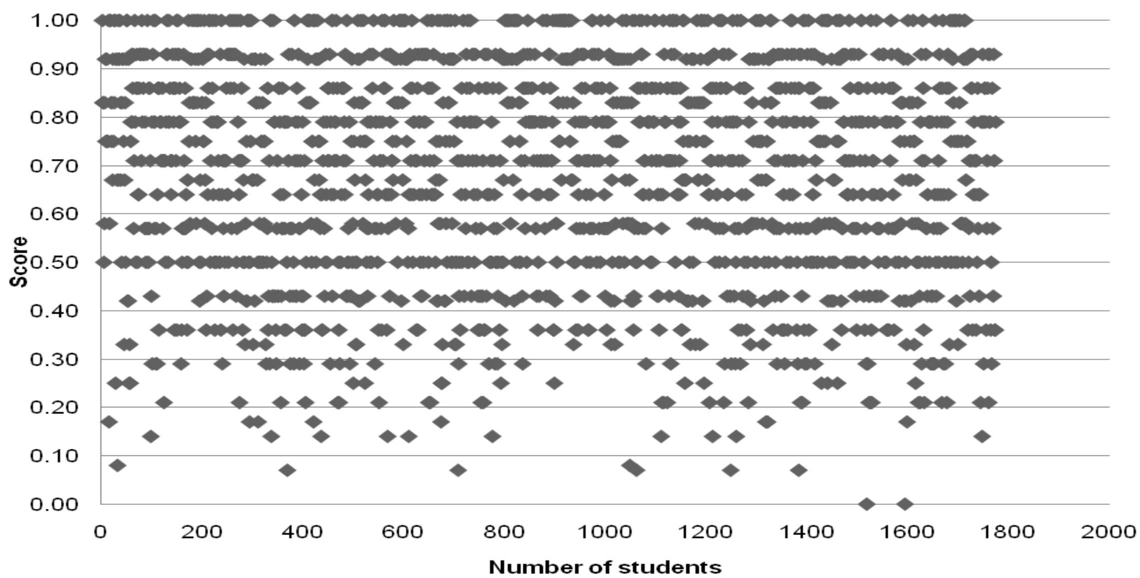


Figure 73. Title schools algebraic relationships 2009 - 2010.
Each diamond represents a student's score.

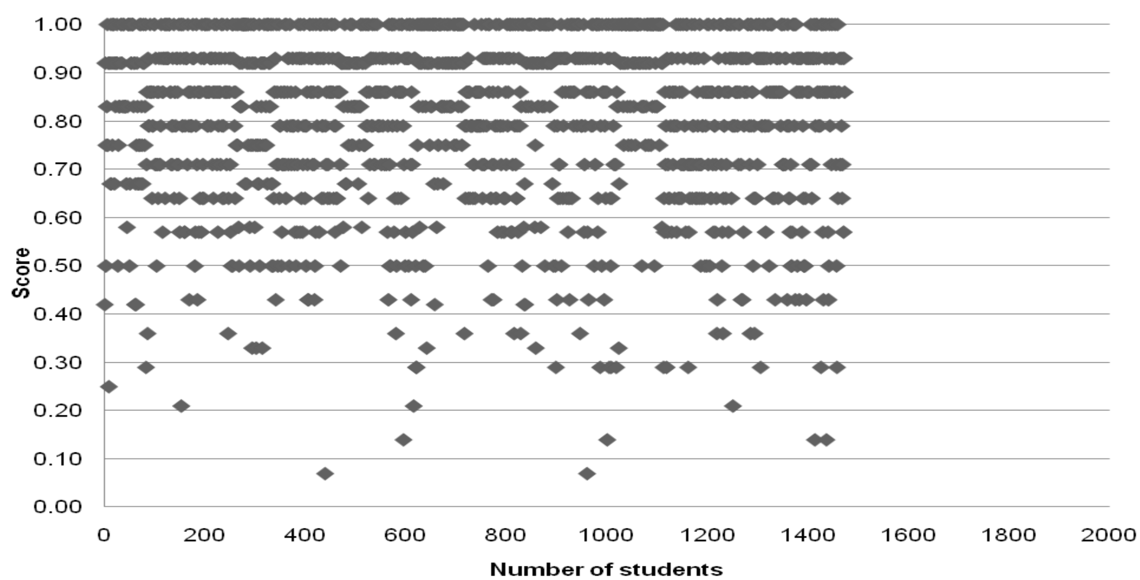


Figure 74. Non-Title schools algebraic relationships 2009 - 2010.
Each diamond represents a student's score.

Geometric and spatial relationships 2005-2006. In Figures 75 and 76 student scores in geometric and spatial relationships for academic year 2005-2006 are represented on the graph. In Figure 75 a larger range of student scores of the 15 Title schools is evident. In Figure 76 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

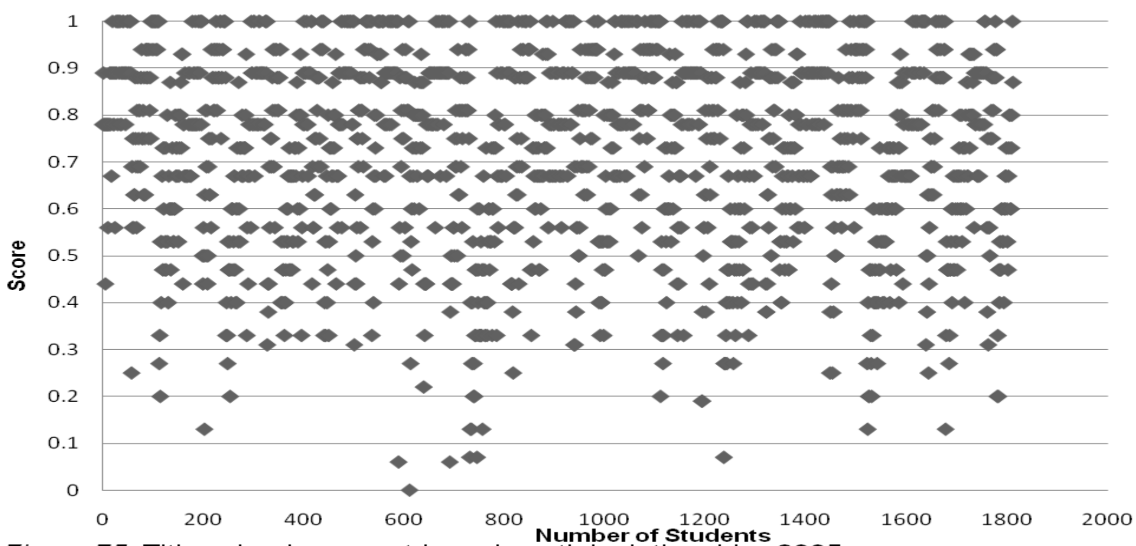


Figure 75. Title schools geometric and spatial relationships 2005 - 2006.

Each diamond represents a student's score.

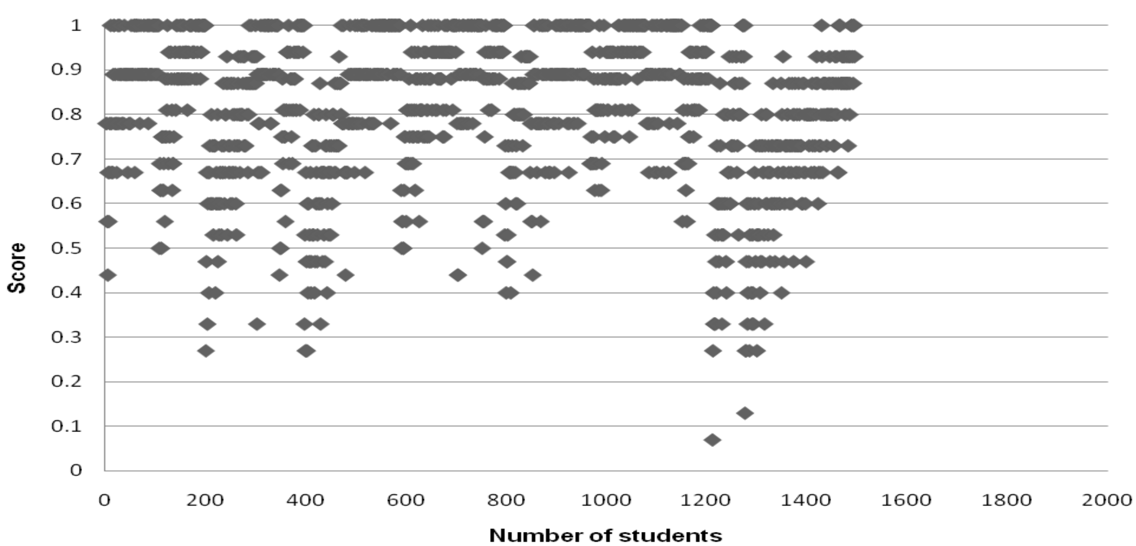


Figure 76. Non-Title schools geometric and spatial relationships 2005 - 2006.

Each diamond represents a student's score.

Geometric and spatial relationships 2006-2007. In Figures 77 and 78 student scores in geometric and spatial relationships for academic year 2006-2007 are represented on the graph. In Figure 77 a larger range of student scores of the 15 Title schools is evident. In Figure 78 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

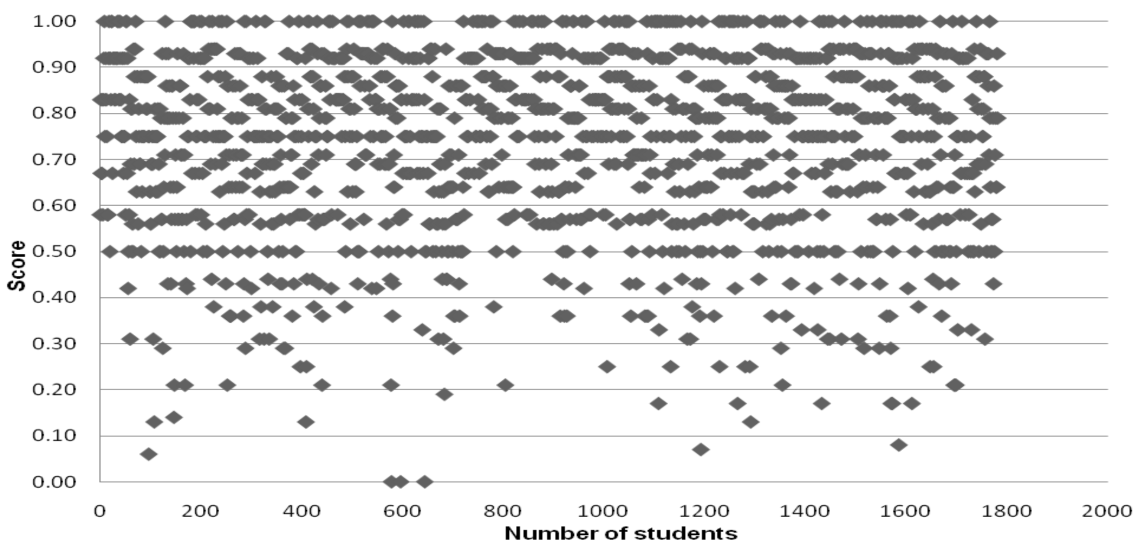


Figure 77. Title schools geometric and spatial relationships 2006 - 2007.

Each diamond represents a student's score.

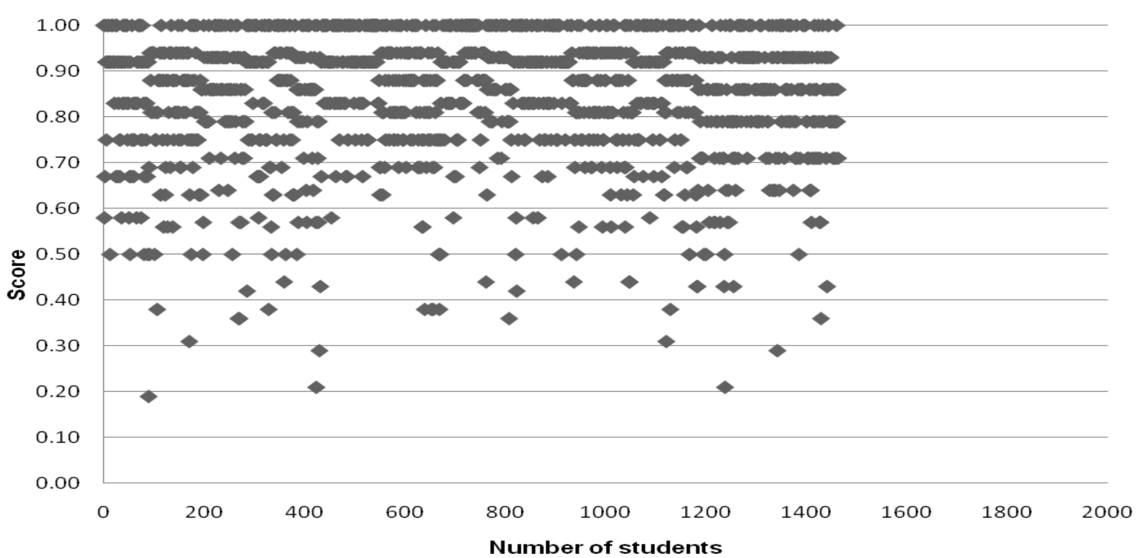


Figure 78. Non-Title schools geometric and spatial relationships 2006 - 2007.
Each diamond represents a student's score.

Geometric and spatial relationships 2007-2008. In Figures 79 and 80 student scores in geometric and spatial relationships for academic year 2007-2008 are represented on the graph. In Figure 79 a larger range of student scores of the 15 Title schools is evident. In Figure 80 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students’ scores within the same mathematical strand.

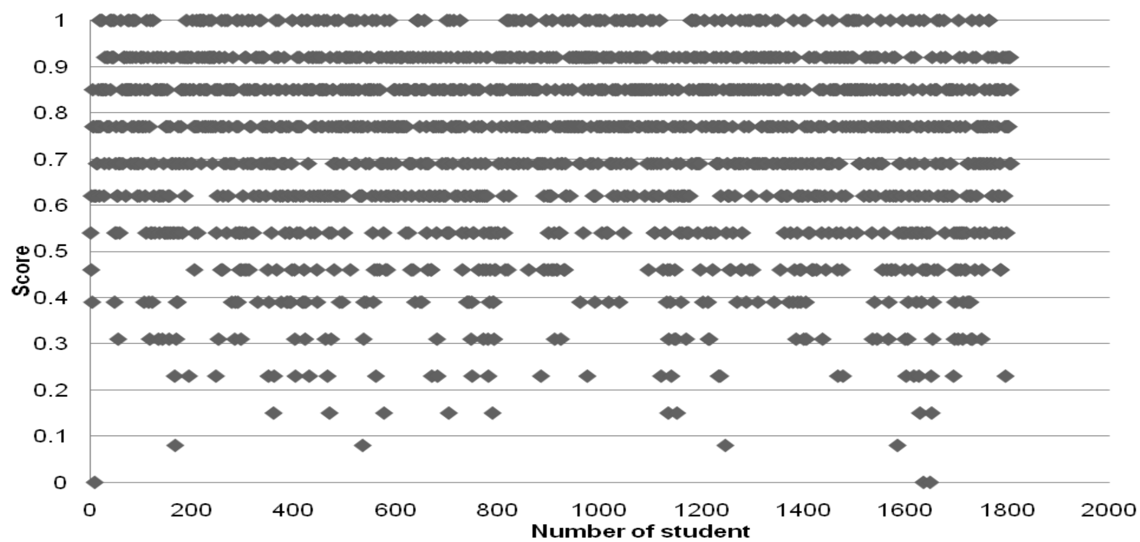


Figure 79. Title schools geometric and spatial relationships 2007 - 2008.

Each diamond represents a student's score.

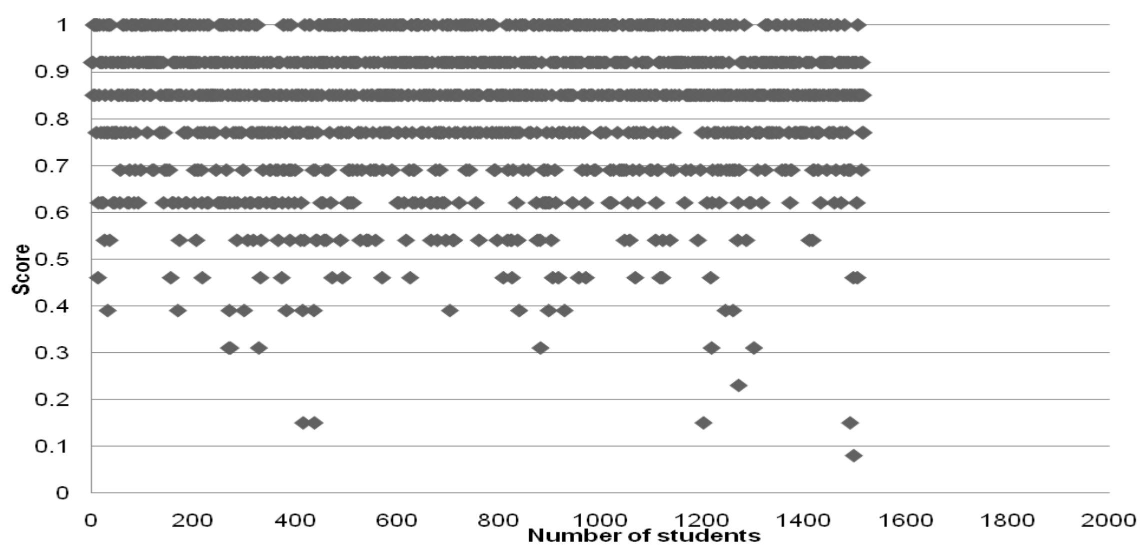


Figure 80. Non-Title schools geometric and spatial relationships 2007 - 2008.

Each diamond represents a student's score.

Geometric and spatial relationships 2008-2009. In Figures 81 and 82 student scores in geometric and spatial relationships for academic year 2008-2009 are represented on the graph. In Figure 81 a larger range of student scores of the 15 Title schools is evident. In Figure 82 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

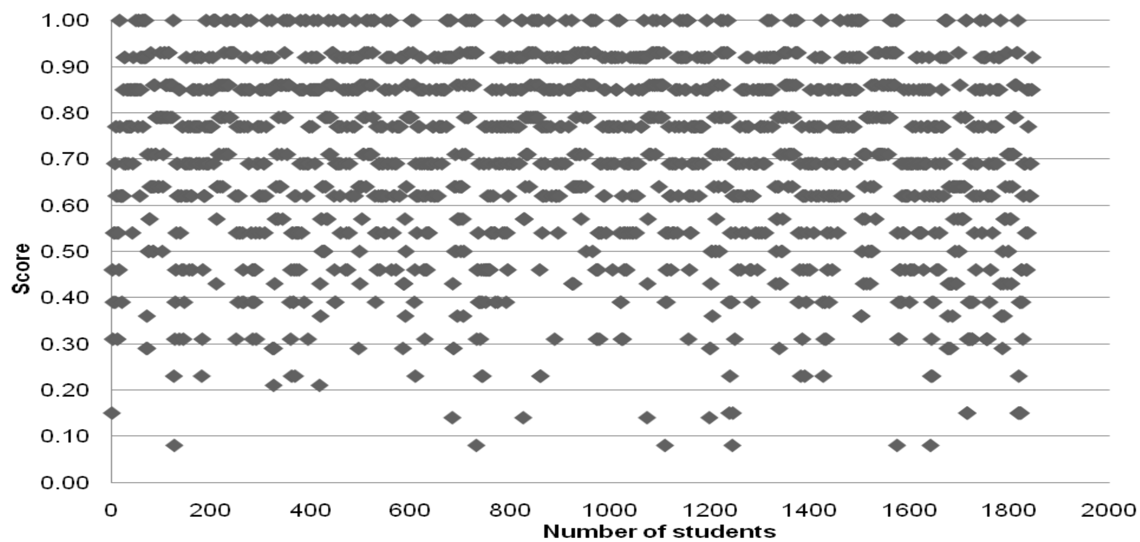


Figure 81. Title schools geometric and spatial relationships 2008 - 2009.
Each diamond represents a student's score.

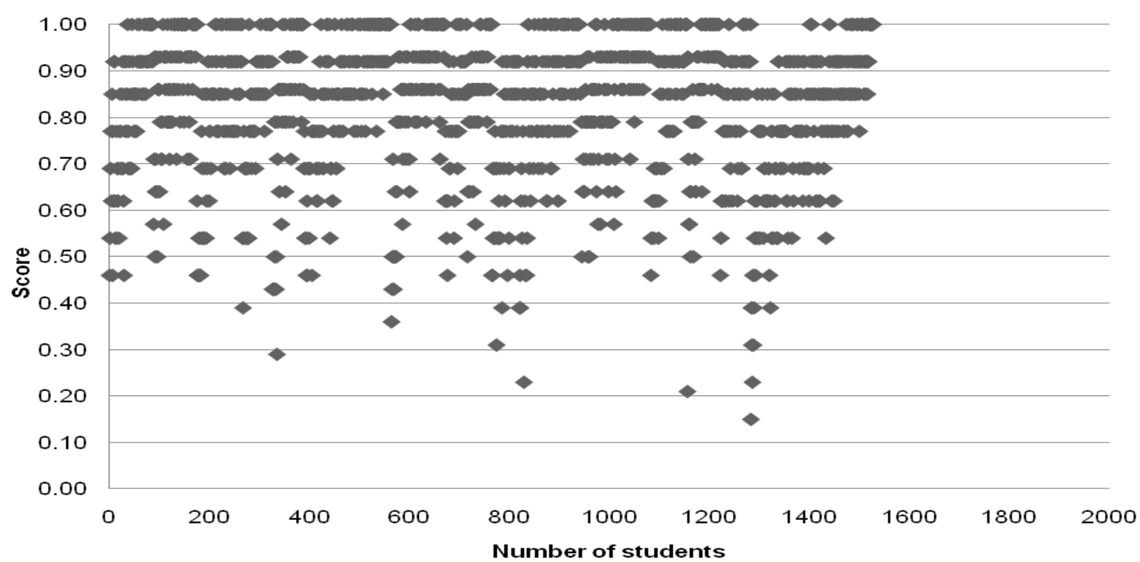


Figure 82. Non-Title schools geometryic and spatial relationships 2008 - 2009.
Each diamond represents a student's score.

Geometric and spatial relationships 2009-2010. In Figures 83 and 84 student scores in geometric and spatial relationships for academic year 2009-2010 are represented on the graph. In Figure 83 a larger range of student scores of the 15 Title schools is evident. In Figure 84 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

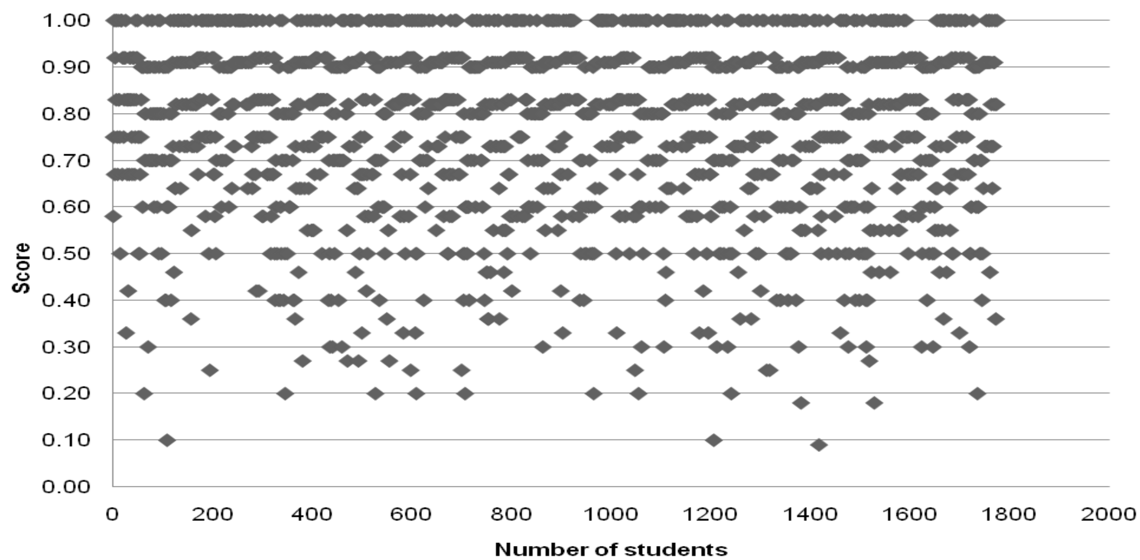


Figure 83. Title schools geometric and spatial relationships 2009 - 2010.
Each diamond represents a student's score.

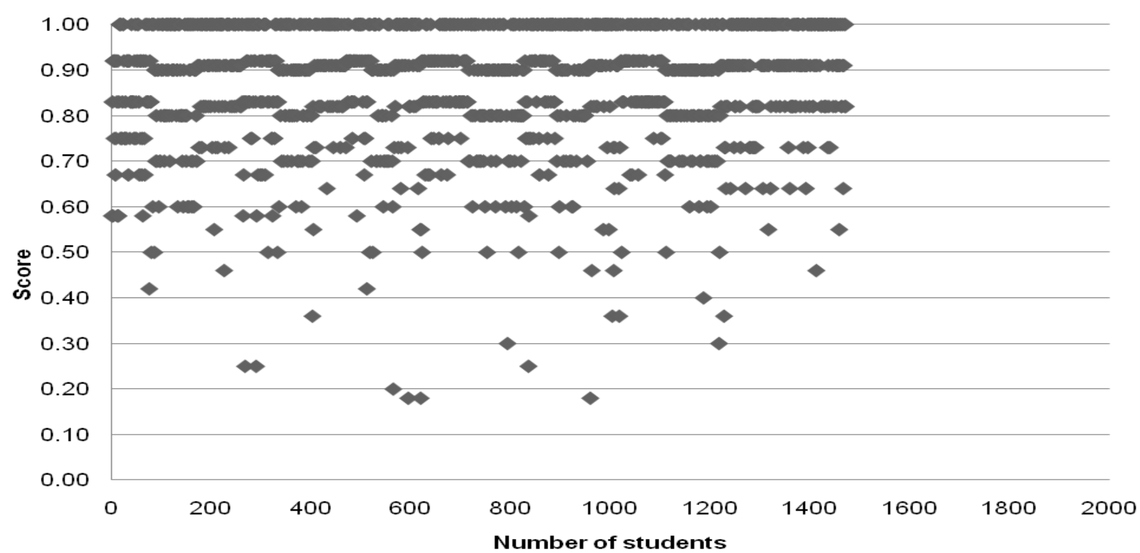


Figure 84. Non-Title Schools geometric and spatial relationships 2009 - 2010.
Each diamond represents a student's score.

Measurement 2005-2006. In Figures 85 and 86 student scores in measurement for academic year 2005-2006 are represented on the graph. In Figure 85 a larger range of student scores of the 15 Title schools is evident. In Figure 86 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

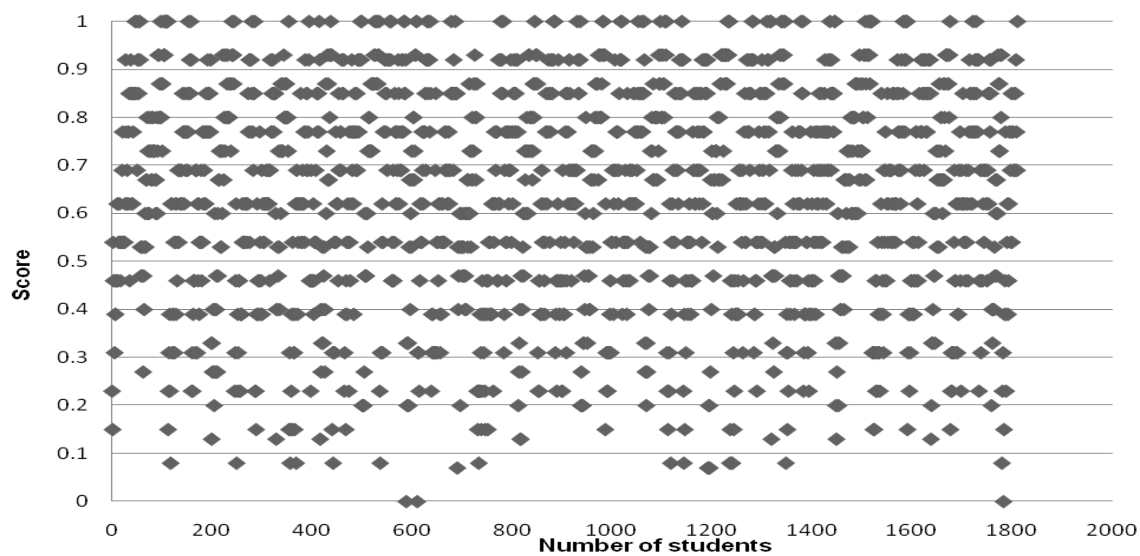


Figure 85. Title Schools Measurement 2005 - 2006.
Each diamond represents a student's score.

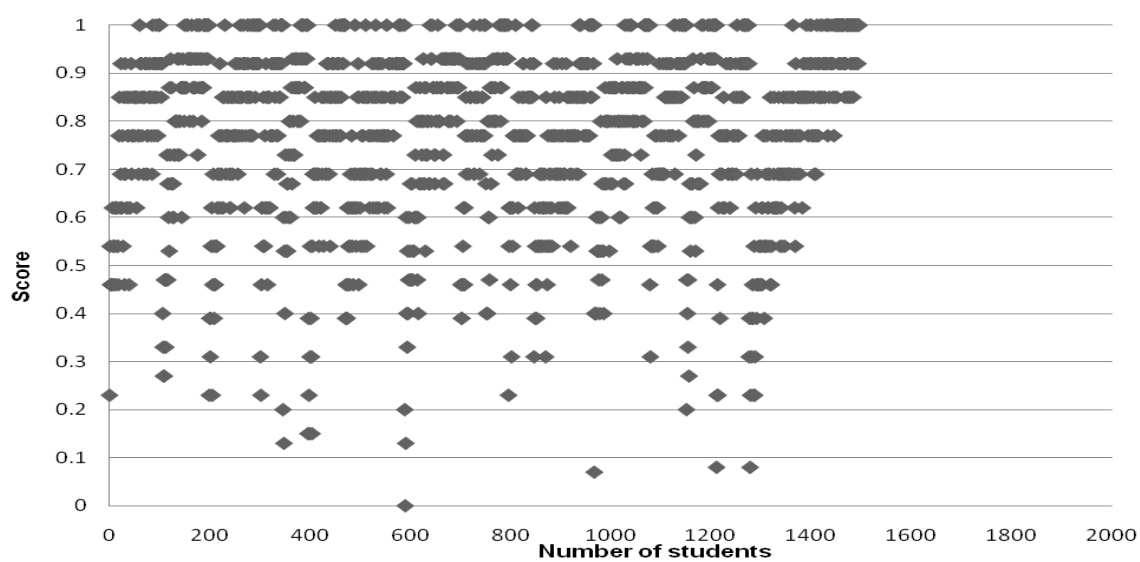


Figure 86. Non-Title schools measurement 2005 - 2006.
Each diamond represents a student's score.

Measurement 2006-2007. In Figures 87 and 88 student scores in measurement for academic year 2006-2007 are represented on the graph. In Figure 87 a larger range of student scores of the 15 Title schools is evident. In Figure 88 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

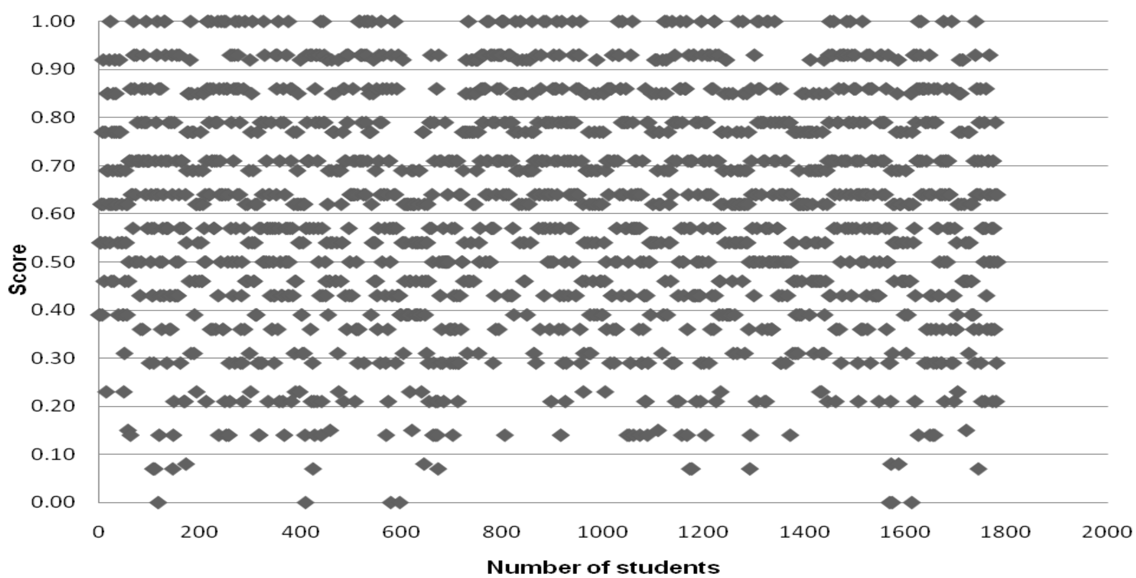


Figure 87. Title schools measurement 2006 - 2007.
Each diamond represents a student's score.

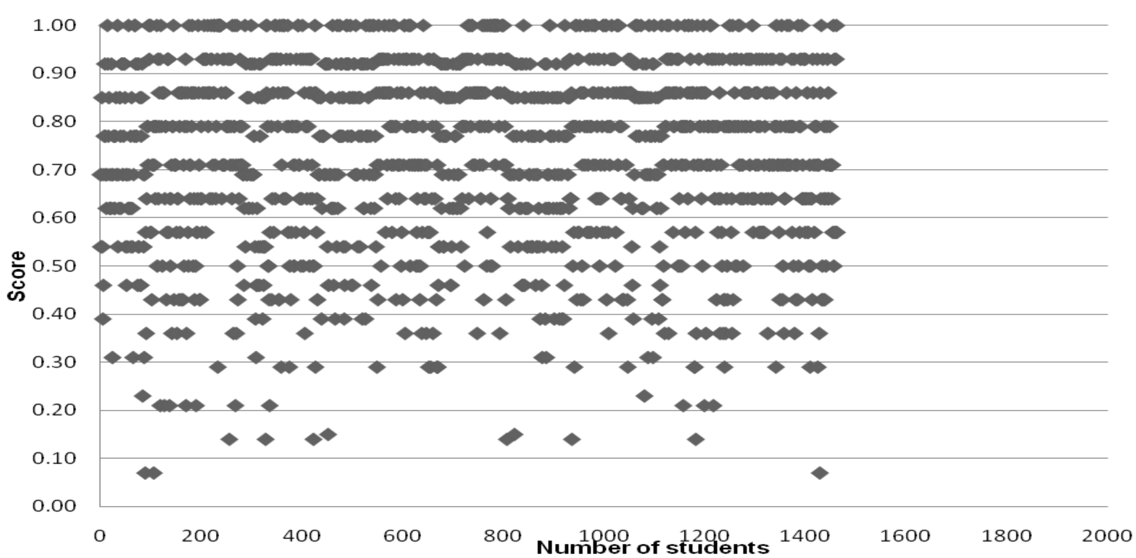


Figure 88. Non-Title schools measurement 2006 - 2007.
Each diamond represents a student's score.

Measurement 2007-2008. In Figures 89 and 90 student scores in measurement for academic year 2007-2008 are represented on the graph. In Figure 89 a larger range of student scores of the 15 Title schools is evident. In Figure 90 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

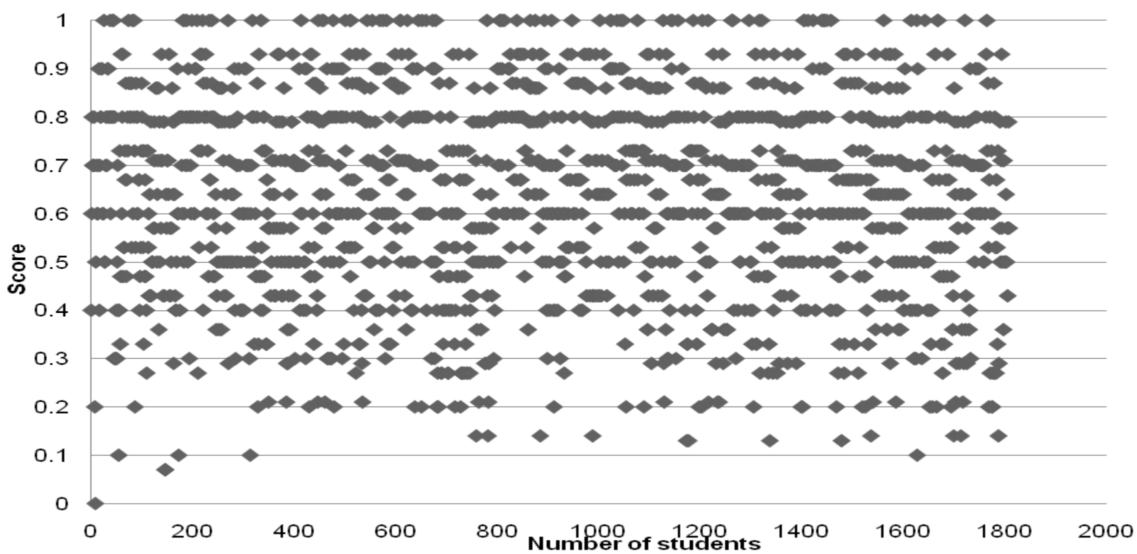


Figure 89. Title schools measurement 2007 - 2008.
Each diamond represents a student's score.

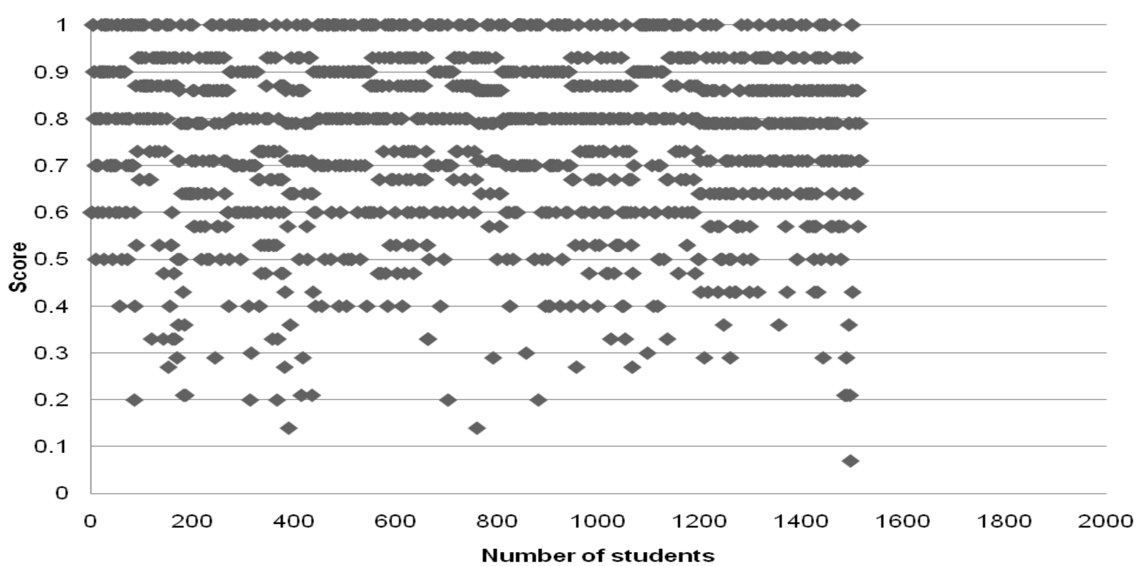


Figure 90. Non-Title schools measurement 2007 - 2008.
Each diamond represents a student's score.

Measurement 2008-2009. In Figures 91 and 92 student scores in measurement for academic year 2008-2009 are represented on the graph. In Figure 91 a larger range of student scores of the 15 Title schools is evident. In Figure 92 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

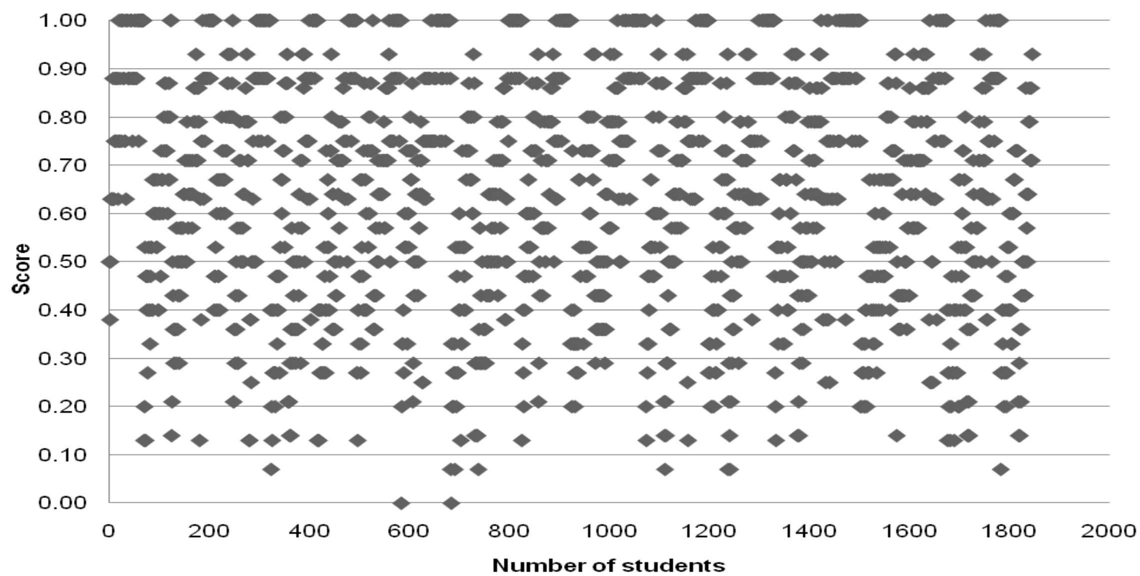


Figure 91. Title schools measurement 2008 - 2009.
Each diamond represents a student's score.

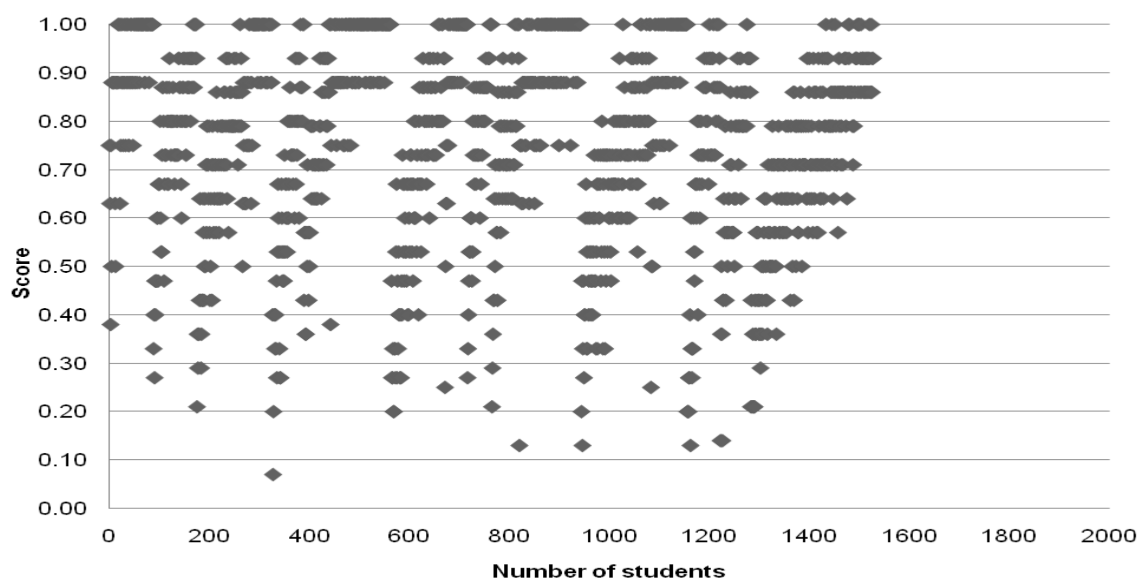


Figure 92. Non-Title schools measurement 2008 - 2009.
Each diamond represents a student's score.

Measurement 2009-2010. In Figures 93 and 94 student scores in measurement for academic year 2009-2010 are represented on the graph. In Figure 93 a larger range of student scores of the 15 Title schools is evident. In Figure 94 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students’ scores within the same mathematical strand.

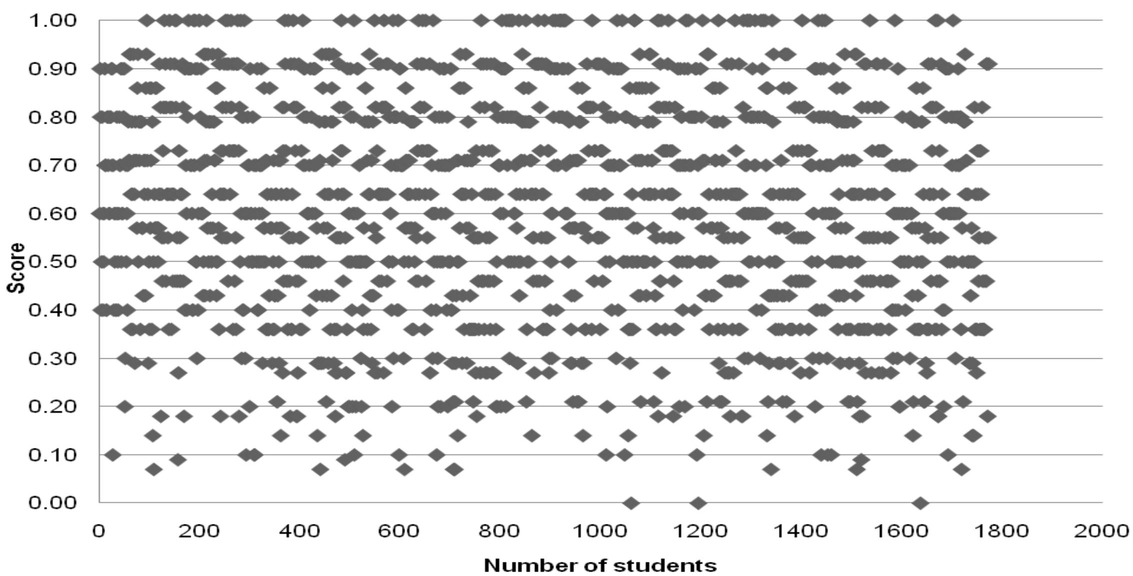


Figure 93. Title schools measurement 2009 - 2010.
Each diamond represents a student's score.

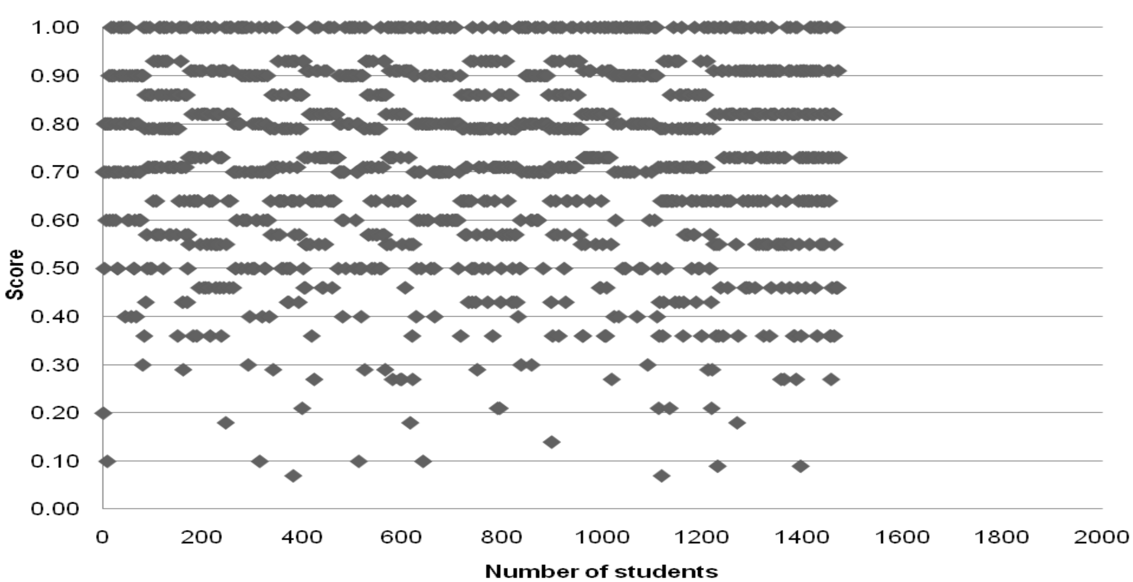


Figure 94. Non-Title Schools Measurement 2009 - 2010.
Each diamond represents a student's score.

Data and probability 2005-2006. In Figures 95 and 96 student scores in data and probability for academic year 2005-2006 are represented on the graph. In Figure 95 a larger range of student scores of the 15 Title schools is evident. In Figure 96 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

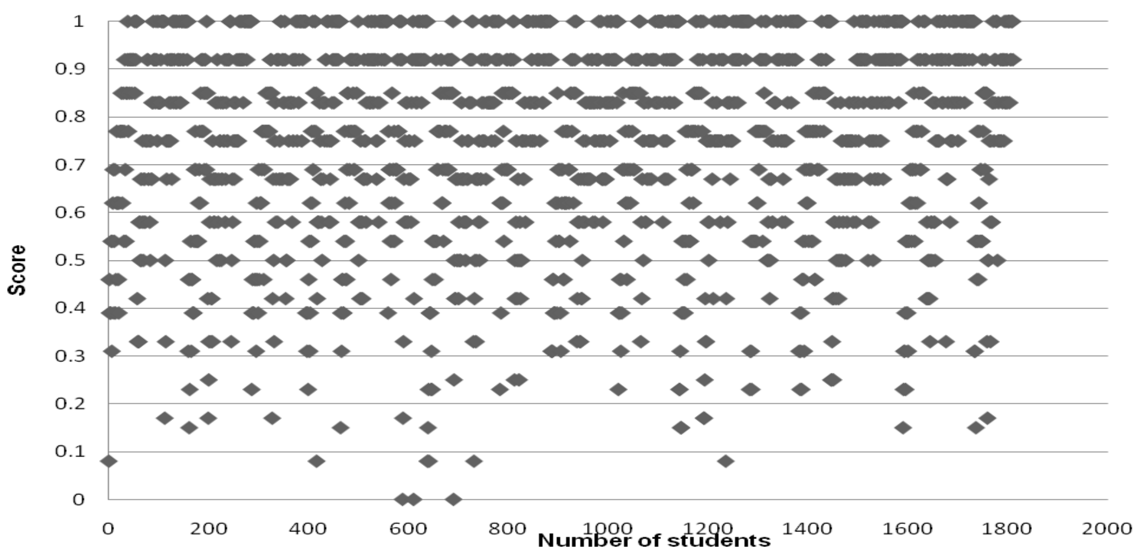


Figure 95. Title schools data and probability 2005 - 2006.
Each diamond represents a student's score.

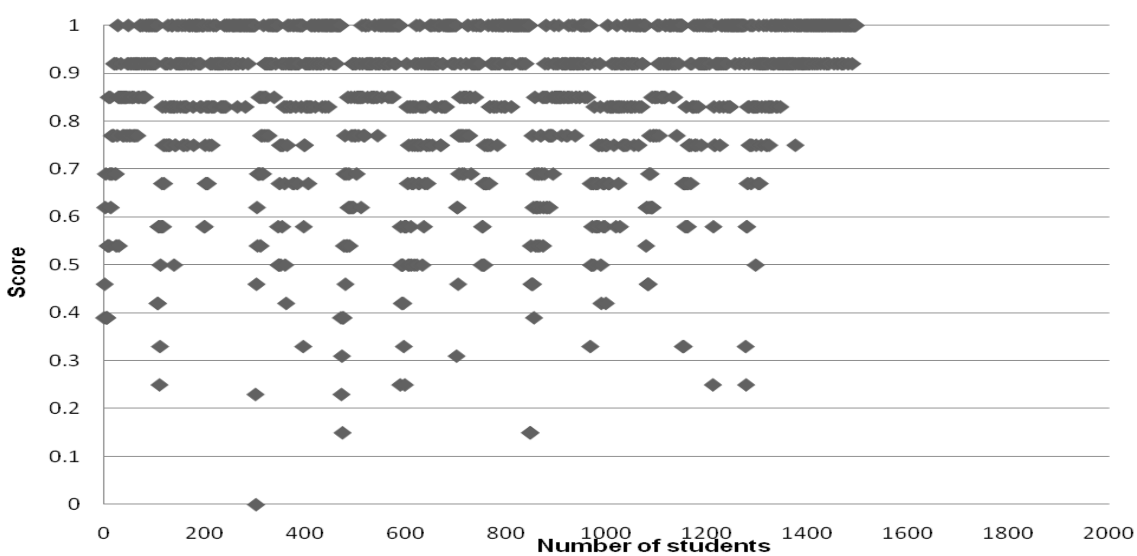


Figure 96. Non-Title schools data and probability 2005- 2006.
Each diamond represents a student's score.

Data and probability 2006-2007. In Figures 97 and 98 student scores in data and probability for academic year 2006-2007 are represented on the graph. In Figure 97 a larger range of student scores of the 15 Title schools is evident. In Figure 98 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

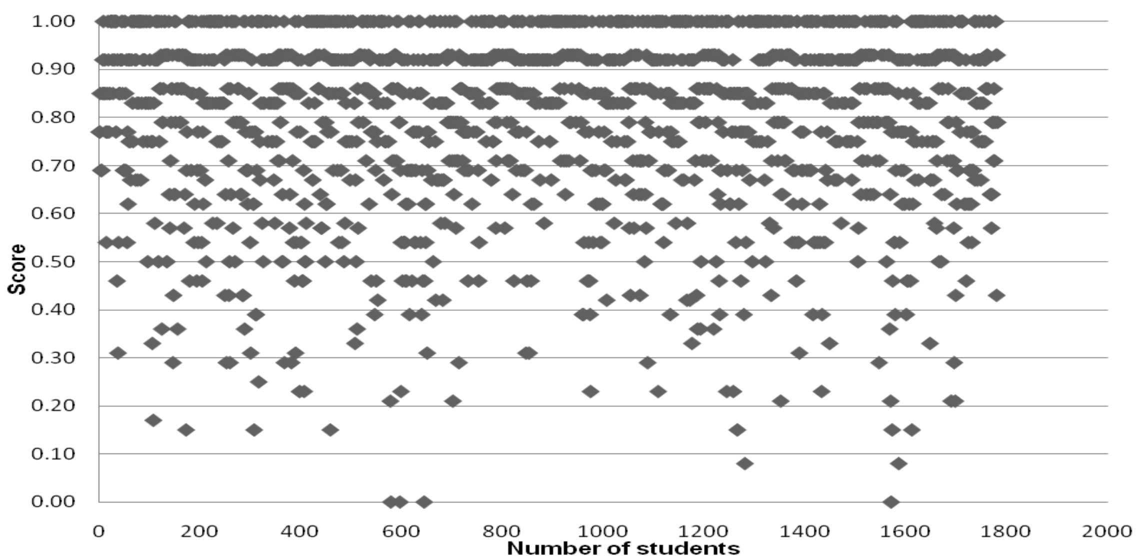


Figure 97. Title schools data and probability 2006 - 2007.
Each diamond represents a student's score.

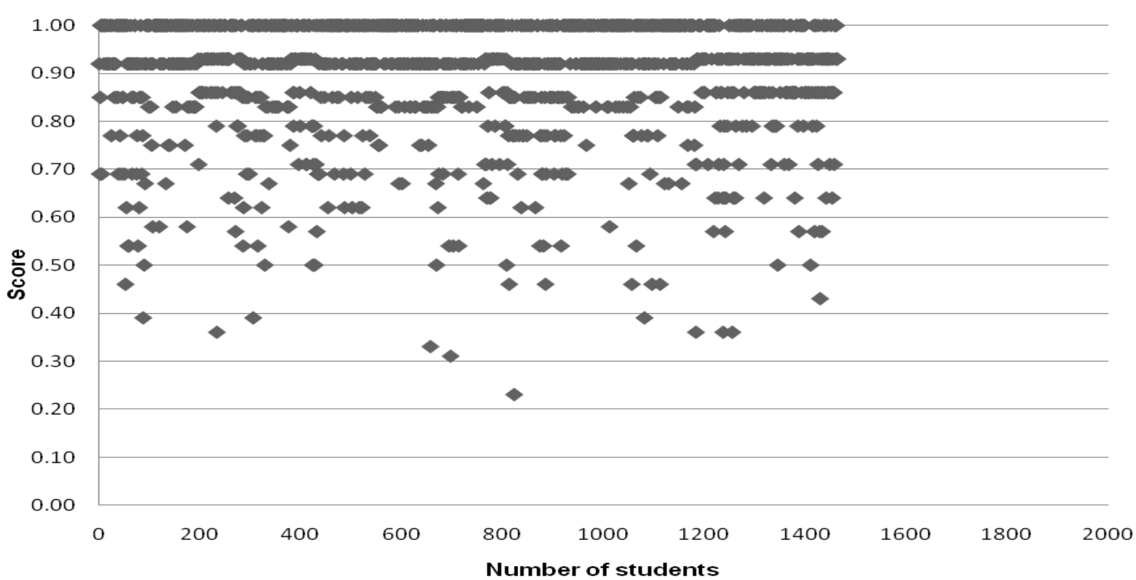


Figure 98. Non-Title schools data and probability 2006 - 2007.
Each diamond represents a student's score.

Data and probability 2007-2008. In Figures 99 and 100 student scores in data and probability for academic year 2007-2008 are represented on the graph. In Figure 99 a larger range of student scores of the 15 Title schools is evident. In Figure 100 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

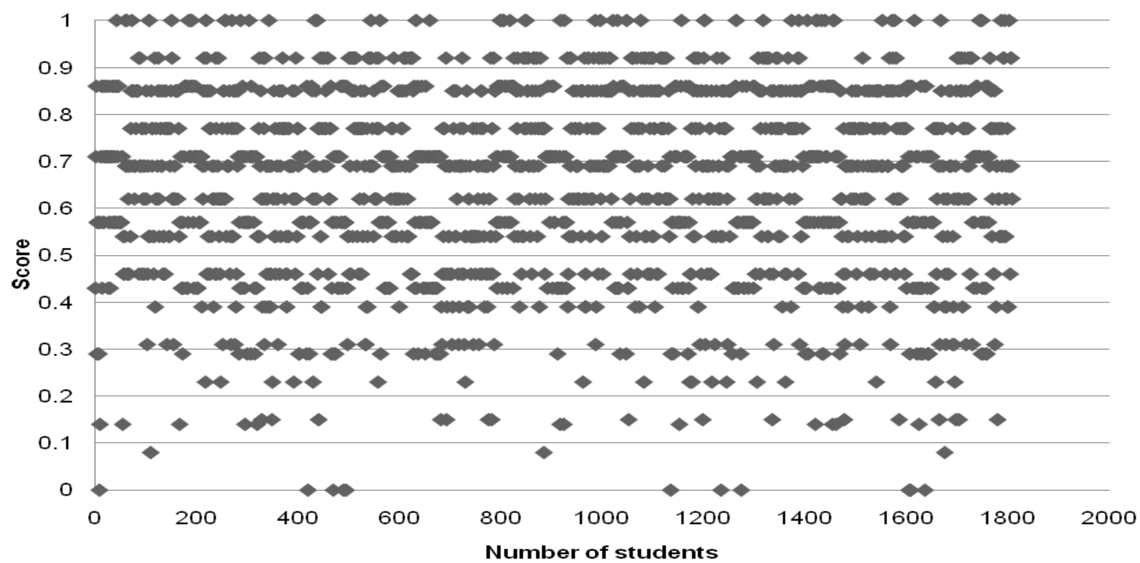


Figure 99. Title schools data and probability 2007 - 2008.
Each diamond represents a student's score.

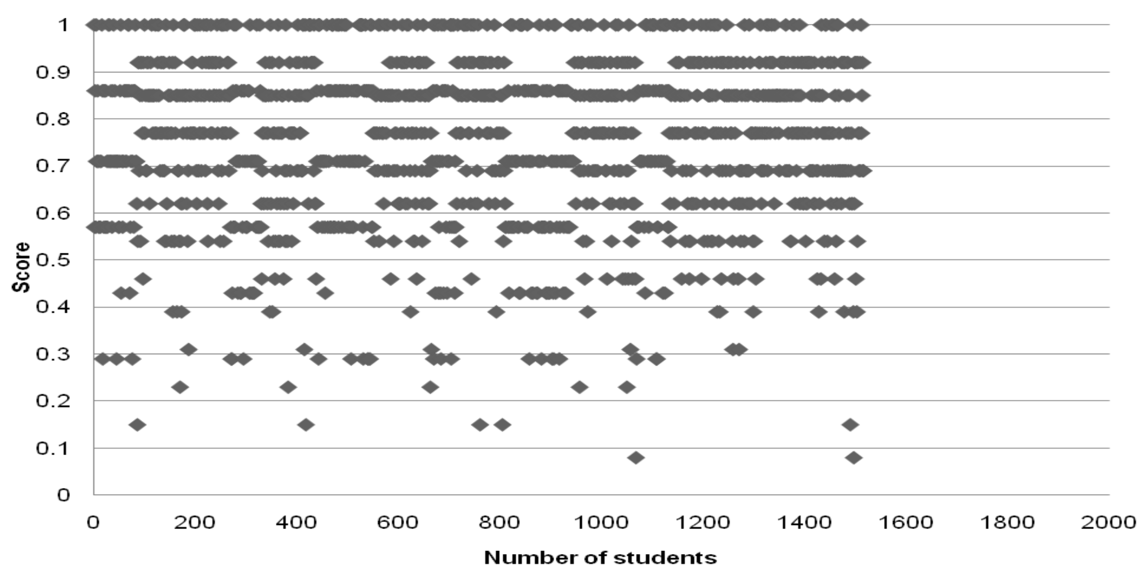


Figure 100. Non-Title schools data and probability 2007 - 2008.
Each diamond represents a student's score.

Data and probability 2008-2009. In Figures 101 and 102 student scores in data and probability for academic year 2008-2009 are represented on the graph. In Figure 101 a larger range of student scores of the 15 Title schools is evident. In Figure 102 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

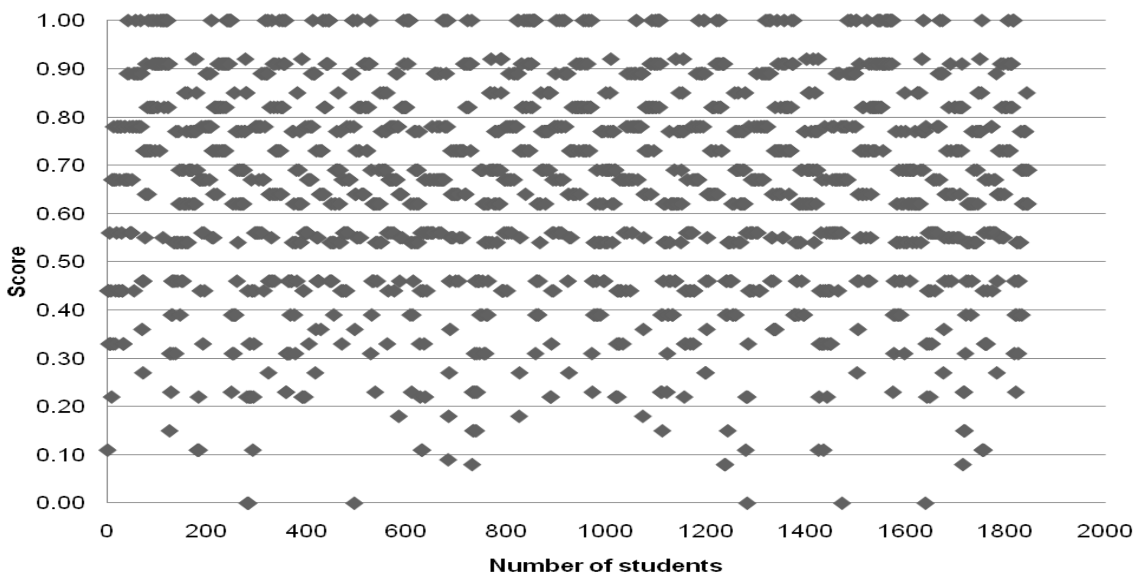


Figure 101. Title schools data and probability 2008 - 2009.
Each diamond represents a student's score.

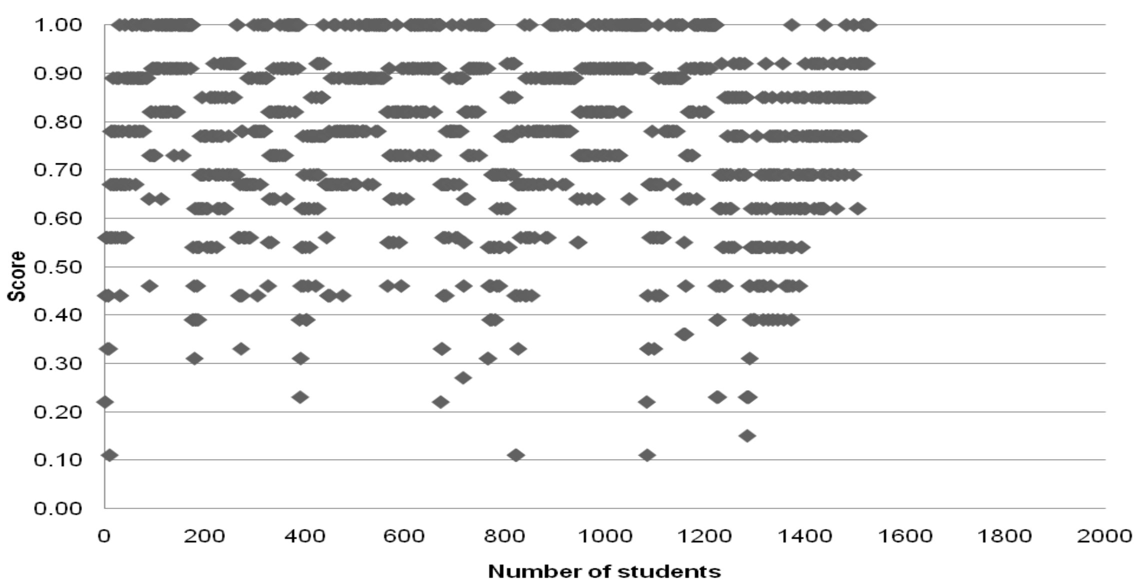


Figure 102. Non-Title schools data and probability 2008 - 2009.
Each diamond represents a student's score.

Data and probability 2009-2010. In Figures 103 and 104 student scores in data and probability for academic year 2009-2010 are represented on the graph. In Figure 103 a larger range of student scores of the 15 Title schools is evident. In Figure 104 the students of the seven Non-Title schools in the study are clustered at a higher level with less students scoring in the lower end of the range. Data were used to compare students' scores within the same mathematical strand.

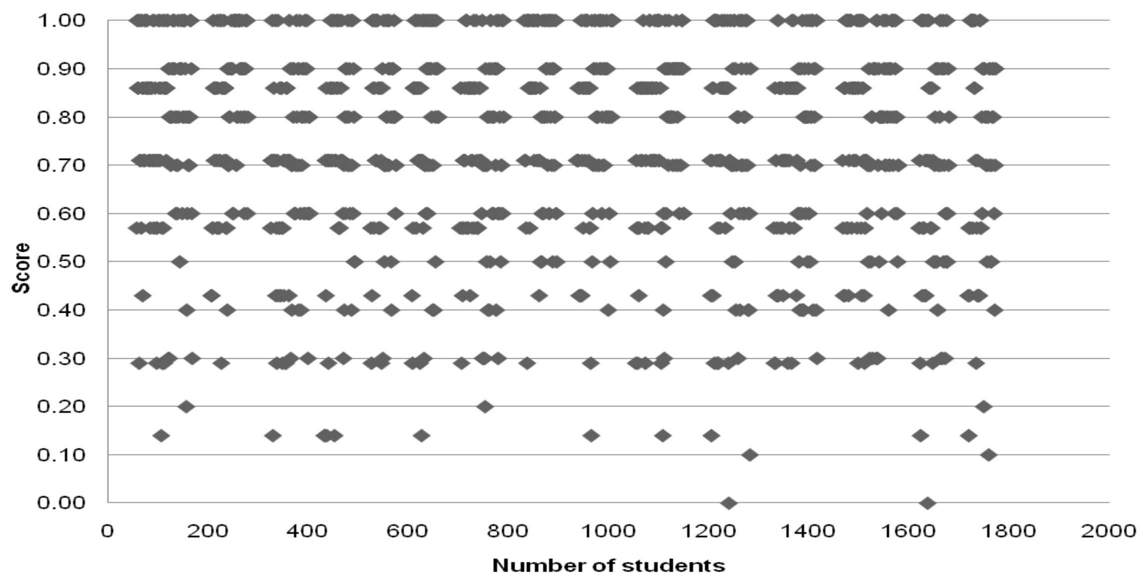


Figure 103. Title schools data and probability 2009 - 2010.
Each diamond represents a student's score.

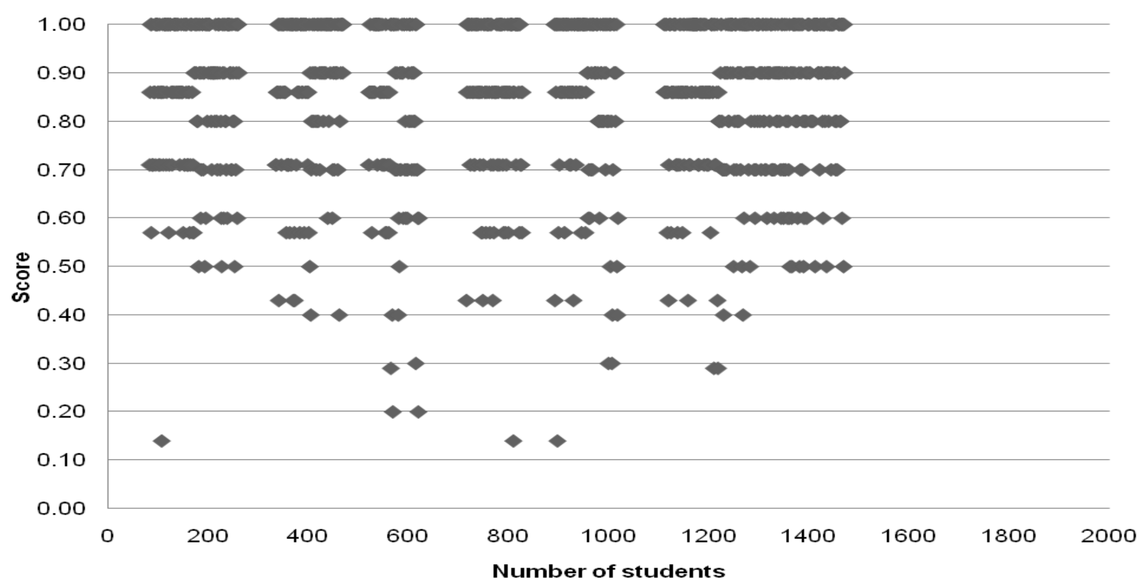


Figure 104. Non-Title schools data and probability 2009 - 2010.
Each diamond represents a student's score.

t-test.A *t*-test was used to look for significance in the difference between scores for Title schools and Non-Title schools in MAP math test content strand scores for the 2005-2010 academic years (See Table 11). The alpha level identified for significance was: $p < \alpha$ .05 (Trochim, 2006d). The *t*-test was conducted where t equals the mean of the Non-Title schools' content strand score for each academic year; minus the mean of the Title schools'content strand score for each year; this total was then divided by the standard error of the difference of the means. The *t*-value was derived from this formula, then using a *t* distribution chart the numbers were found with the alpha level to determine a level of confidence. In research questions one and two BOY and EOY scores were compared. Research questions three and four compared the schools scores within the content area. This resulted in a larger range of confidence levels.

Table 11

Level of Confidence for MAP Test by Content Strands

Test	*t* - value	Alpha Level	Level of Confidence
2005-2006 Number and Operations	20.31	0.05	1.73
2005-2006 Algebra	16.82	0.05	1.74
2005-2006 Geometry	12.78	0.05	1.77
2005-2006 Measurement	18.67	0.05	1.73
2005-2006 Data and Probability	16.96	0.05	1.74
2006-2007 Number and Operations	17.65	0.05	1.73
2006-2007 Algebra	17.72	0.05	1.73
2006-2007 Geometry	17.65	0.05	1.73
2006-2007 Measurement	17.28	0.05	1.74
2006-2007 Data and Probability	17.30	0.05	1.74
2007-2008 Number and Operations	23.05	0.05	1.71
2007-2008 Algebra	20.96	0.05	2.02
2007-2008 Geometry	17.12	0.05	1.74
2007-2008 Measurement	19.13	0.05	1.73
2007-2008 Data and Probability	17.18	0.05	1.74
2008-2009 Number and Operations	20.88	0.05	1.72
2008-2009 Algebra	16.60	0.05	1.74
2008-2009 Geometry	19.25	0.05	1.73
2008-2009 Measurement	15.34	0.05	1.75
2008-2009 Data and Probability	17.65	0.05	1.73
2009-2010 Number and Operations	20.23	0.05	1.73
2009-2010 Algebra	18.17	0.05	1.73
2009-2010 Geometry	16.20	0.05	1.75
2009-2010 Measurement	17.54	0.05	1.73
2009-2010 Data and Probability	13.71	0.05	1.76

Statistical Landmarks 2005-2006. The statisical landmarks in this study are presented in Table 12 to show the differences between the two groups. In the landmarks, maximum and minimum were used to compare highs and lows within a group. Mean was used to compare the group average, and standard deviation was used to show how the groups break away from the distribution curve. To help make the comparisons in achievement the Title to Non-Title schools average students' scores in each of the content strands can be analyzed. The average achievement scores between Non-Title and Title schools were in the 8-10 point range. The difference in achievement between the Non-Title and Title schools is evidence of the gap between the two type of schools. The larger gaps represent areas of greater concern.

Table 12

Statistical Landmarks for 2005-2006 MAP Math Test Grouped by Content Strand and Title Status

Academic Year by Content Strand	Maximum	Minimum	Mean	Standard Deviation
2005-2006 Number and Operations (TS)	100	0	71.73	20.13
2005-2006 Number and Operations (NTS)	100	16	84.20	15.16
2005-2006 Algebra (TS)	100	0	66.75	21.25
2005-2006 Algebra (NTS)	100	0	77.90	16.86
2005-2006 Geometry (TS)	100	0	74.18	20.31
2005-2006 Geometry (NTS)	100	7	82.28	16.13
2005-2006 Measurement (TS)	100	0	64.10	22.77
2005-2006 Measurement (NTS)	100	0	77.31	17.90
2005-2006 Data and Probability (TS)	100	0	75.93	21.02
2005-2006 Data and Probability (NTS)	100	0	86.78	15.74

Statistical landmarks 2006-2007. The statisical landmarks in this study are presented in Table 13 to show the differences between the two groups. In the landmarks, maximum and minimum were used to compare highs and lows within a group. Mean was used to compare the group average, and standard deviation was used to show how the groups break away from the distribution curve. To help make the comparisons in achievement the Title to Non-Title schools average students' scores in each of the content strands can be analyzed. The average achievement scores between Non-Title and Title schools were in the 8-10 point range. The difference in achievement between the Non-Title and Title schools is evidence of the gap between the two type of schools. The larger gaps represent areas of greater concern.

Table 13

Statistical Landmarks for 2006-2007 MAP Math Test Grouped by Content Strand and Title Status

Academic Year by Content Strand	Maximum	Minimum	Mean	Standard Deviation
2006-2007 Number and Operations (TS)	100	5	73.55	20.26
2006-2007 Number and Operations (NTS)	100	13	84.49	14.86
2006-2007 Algebra (TS)	100	0	60.07	23.25
2006-2007 Algebra (NTS)	100	6	73.28	19.15
2006-2007 Geometry (TS)	100	0	74.82	18.93
2006-2007 Geometry (NTS)	100	19	85.06	13.92
2006-2007 Measurement (TS)	100	0	60.90	22.30
2006-2007 Measurement (NTS)	100	7	73.50	19.14
2006-2007 Data and Probability (TS)	100	0	81.21	18.37
2006-2007 Data and Probability (NTS)	100	23	90.59	12.14

Statistical landmarks 2007-2008. The statisical landmarks in this study are presented in Table 14 to show the differences between the two groups. In the landmarks, maximum and minimum were used to compare highs and lows within a group. Mean was used to compare the group average, and standard deviation was used to show how the groups break away from the distribution curve. To help make the comparisons in achievement the Title to Non-Title schools average students' scores in each of the content strands can be analyzed. The average achievement scores between Non-Title and Title schools were in the 8-10 point range. The difference in achievement between the Non-

Title and Title schools is evidence of the gap between the two type of schools. The larger gaps represent areas of greater concern.

Table 14

Statistical Landmarks for 2007-2008 MAP Math Test Grouped by Content Strand and Title Status

Academic Year by Content Strand	Maximum	Minimum	Mean	Standard Deviation
2007-2008 Number and Operations (TS)	100	0	69.98	20.74
2007-2008 Number and Operations (NTS)	100	13	84.40	15.12
2007-2008 Algebra (TS)	100	0	58.94	23.55
2007-2008 Algebra (NTS)	100	0	74.37	18.80
2007-2008 Geometry (TS)	100	0	73.24	19.53
2007-2008 Geometry (NTS)	100	8	83.41	14.53
2007-2008 Measurement (TS)	100	0	64.16	20.49
2007-2008 Measurement (NTS)	100	7	76.85	17.65
2007-2008 Data and Probability (TS)	100	0	65.12	19.83
2007-2008 Data and Probability (NTS)	100	8	76.20	17.23

Statistical landmarks 2008-2009. The statisical landmarks in this study are presented in Table 15 to show the differences between the two groups. In the landmarks, maximum and minimum were used to compare highs and lows within a group. Mean was used to compare the group average, and standard deviation was used to show how the groups break away from the distribution curve. To help make the comparisons in achievement the Title to Non-Title schools average students' scores in each of the content strands can be analyzed. The average achievement scores between Non-Title and Title schools were in the 8-10 point range. The difference in achievement between the Non-Title and Title schools is evidence of the gap between the two type of schools. The larger gaps represent areas of greater concern.

Table 15

Statistical Landmarks for 2008-2009 MAP Math Test Grouped by Content Strand and Title Status

Academic Year by Content Strand	Maximum	Minimum	Mean	Standard Deviation
2008-2009 Number and Operations (TS)	100	0	68.33	21.11
2008-2009 Number and Operations (NTS)	100	5	81.74	16.03
2008-2009 Algebra (TS)	100	0	63.80	23.39
2008-2009 Algebra (NTS)	100	0	76.90	18.85
2008-2009 Geometry (TS)	100	8	71.62	19.57
2008-2009 Geometry (NTS)	100	18	83.10	14.90
2008-2009 Measurement (TS)	100	0	65.67	24.37
2008-2009 Measurement (NTS)	100	7	77.40	19.96
2008-2009 Data and Probability (TS)	100	0	66.68	20.74
2008-2009 Data and Probability (NTS)	100	14	78.36	17.58

Statistical landmarks 2009-2010. The statisical landmarks in this study are presented in Table 16 to show the differences between the two groups. In the landmarks, maximum and minimum were used to compare highs and lows within a group. Mean was used to compare the group average, and standard deviation was used to show how the groups break away from the distribution curve. To help make the comparisons in achievement the Title to Non-Title schools average students' scores in each of the content strands can be analyzed. The average achievement scores between Non-Title and Title schools were in the 8-10 point range. The difference in achievement between the Non-Title and Title schools is evidence of the gap between the two type of schools. The larger gaps represent areas of greater concern.

Table 16

Statistical Landmarks for 2009-2010 MAP Math Test Grouped by Content Strand and Title Status

Academic Year and Test Period	Maximum	Minimum	Mean	Standard Deviation
2009-2010 Number and Operations (TS)	100	0	68.34	21.16
2009-2010 Number and Operations (NTS)	100	13	81.67	16.17
2009-2010 Algebra (TS)	100	0	68.84	22.43
2009-2010 Algebra (NTS)	100	7	81.64	17.52
2009-2010 Geometry (TS)	100	9	78.39	18.29
2009-2010 Geometry (NTS)	100	18	87.48	13.34
2009-2010 Measurement (TS)	100	0	61.25	22.41
2009-2010 Measurement (NTS)	100	7	74.03	18.97
2009-2010 Data and Probability (TS)	100	0	74.33	21.17
2009-2010 Data and Probability (NTS)	100	14	85.43	16.27

Pearson r. A Pearson *r* was used to analyze the data for correlation. The correlation between the Title and Non-Title content strand scores for each academic year are presented in Table 17. When comparing the scores of Title and Non-Title schools a small correlation, both positive and negative where found between the achievement scores of the two divisions of schools.

Table 17

Correlation Factor of MAP Math Test Content Strand Scores for Title and Non-Title Schools

School Year	Strand	Correlation
2005-2006	Number and Operations	0.42
2005-2006	Algebra	0.42
2005-2006	Geometry	0.18
2005-2006	Measurement	0.14
2005-2006	Data and Probability	0.69
2006-2007	Number and Operations	-0.07
2006-2007	Algebra	-0.06
2006-2007	Geometry	0.22
2006-2007	Measurement	0.09
2006-2007	Data and Probability	0.48
2007-2008	Number and Operations	-0.25
2007-2008	Algebra	-0.04
2007-2008	Geometry	0.12
2007-2008	Measurement	-0.04
2007-2008	Data and Probability	-0.76
2008-2009	Number and Operations	0.36
2008-2009	Algebra	0.20
2008-2009	Geometry	-0.31
2008-2009	Measurement	0.04
2008-2009	Data and Probability	0.05
2009-2010	Number and Operations	0.21
2009-2010	Algebra	0.29
2009-2010	Geometry	0.12
2009-2010	Measurement	0.07
2009-2010	Data and Probability	-0.38

Interviews

Interviews were conducted with 12 elementary principals on-site. Six of the principals served in a Title I school, the other six did not. Interviews lasted between five and twenty minutes depending on the explanations the principals were interested in making on some of the questions. The interviews were conducted as the qualitative portion of the mixed-method study to answer research question five.

Research Question Five

How do building level principals perceive the mathematical academic performance of students from high and low socioeconomic status? Interview questions one, two, and three were designed to obtain general information about the school and principal being interviewed. Please see Appendix F for the complete list of questions.

Interview Question 4. Which of the math strands do you believe cause your students the most difficulty (The mathematical strands are: algebraic relationships, geometric and spatial relationship, data and probability, measurement, and number and operations)? Why?

Each of the five content strands was mentioned by the principals. For the students in Title I schools, students most often seemed to be lacking the basics of number and operations. Principal Garcia of TS-8 stated students in TS-8 had a problem with measurement because the students lack the basic number and operations skills to complete the work. Principal Rodriguez from TS-5 compared knowing number and operations to reading. The students need to be able to read the number line like they are able to read the alphabet chart, and the fluency was slower developing in students in Title I schools.

For the students in Non-Title schools, measurement was the content strand most often identified as an area of concern. Principal Miller at NTS-10 identified time and money as two issues with which students had the most difficulty. The belief was digital clocks and the lack of students using money, either play or real, caused this impact. Principal Brown at NTS-4 said measurement was a concern due to the fact that students were not able to connect the why to what they were learning in measurement.

Principal Wilson at TS-7 and Principal Thomas at NTS-2 both mentioned algebraic relationships, due to the students not being as familiar with the topic. Principal Martinez at TS-4 and Principal Jones at NTS-9 both identified data and probability as a concern for the students. Principals Jones and Martinez acknowledged the difficulty with abstract thinking associated with the data and probability strand and the students not being able to make concrete connections to the learning.

Interview Question 5. What are your students able to do with great success during mathematics while in the classroom?

Each principal responded with a different answer to this question; however, all of the answers contained the same thread. Experiences which gave background and learning and provided concrete meaning for the students produced a better understanding of the concept being studied. Principal Williams from NTS-3 said his students use the skills they have acquired and put them into current learning. Principal Taylor from TS-2 discussed the students in the higher grades becoming stronger in math skills due to the strong focus on the skills in the early grades. Principal Davis at TS-9 shared the teachers building mastery of skills in the early grades helped students become stronger in mathematics through the progression of grades.

Interview Question 6. In regard to understanding the concepts of mathematics, what do you believe sets your students apart from peers in other schools across the district?

The principals' answers to this question were very different depending on the percentage of F/R of their particular school. Principals in the schools with a low percentage of F/R discussed the high involvement of the parents and the high expectations of all. Principal Sikes of NTS-1 replied "a lot of our students have some real life experiences that they can reflect on. And we have high parental support at our school." However, principals in schools with a high percentage of F/R students noted issues such as low levels of parental knowledge, transient students, and lack of experience with complex problems. The principals with a low percentage of F/R also mentioned the students felt challenged, so they were willing to work hard. Principal Garcia of TS-8 noted, "The high mobility of my students and the transient nature of my school…students have attended up to six schools in a year…the class can be progressing, and then have to backtrack to catch up the new students." Also, the schools with the high percentage F/R had access to more staff from the use of Title I monies.

Interview Question 7. What challenges must your teachers overcome in order for mathematics learning to take place?

According to reports from the principals, teachers in schools with a low percentage of F/R often had to overcome the challenges of students having to choose between after-school activities and homework, a lack of time to teach what was needed in the curriculum, and parents without knowledge of the current curriculum. Teachers in a school with a high percentage of F/R students had to deal with student motivation, the transient nature of students in poverty, and parent ability to help students. Principal Wilson of TS-8 shared, “A number of students try to move beyond the socio-economic status they face.” All principals discussed motivation, but it came from different reasons based on socio-economic class. Principal Thomas of NTS-2 discussed, “Some challenges are the sports and after-school activities which get in the way of homework.”

Interview Question 8. What challenges must your students overcome in order for mathematics learning to take place?

The responses to this question were similar to the previous question of teacher challenges. Students in a school with a low percentage of F/R lunch often had the issue of not being challenged by the curriculum, the time to learn the curriculum, and the technology for learning mathematics not on track with what the students experienced on a daily basis. Principal Brown of NTS-4 found students “have less time to acquire and practice concepts.” Schools with a high percentage of students who qualify for F/R faced challenges of not having the basics and experiences to understand the concepts, motivation, lack of parental support at home, and real-life connections to the learning. Principal Martinez from TS-4 spoke of “the gaps in basic knowledge because the kids are highly transient.”

Interview Question 9. What do you believe is the difference between the mathematical knowledge of the students in a title and non-title school?

The general consensus of the principals regarding the difference in mathematical knowledge of students in the Title and Non-Title schools was attributed to real-life experiences. Principal Williams at NTS-3 and Principal Thomas at NTS-2 discussed students in a Non-Title school having much more experience with money and the use of money. Due to students receiving allowances or seeing parents deal with money, the students have more exposure with the concept. Principal Taylor from TS-2 described the gaps the students had to overcome and all the basic knowledge needed for these students to be on the same level as non-title peers. Principal Garcia of TS-8 detailed a language barrier which the students must overcome. The basic vocabulary in the language of mathematics that the students are often lacking is less for students who entered a school with a high percentage of F/R students.

Summary

In Chapter Four, the data were presented to allow the discussion of the research questions. The response rate for the participation in the interviews was discussed. Also, the demographic data for each of the tests and testing windows was described. Each quantitative research question was supported by student test score data. A *t*-test to document significance, a Pearson *r* to demonstrate correlation, and a review of statistical landmarks documented trends in the data. The data from the quantitative research question were supported by the responses to the interview questions by the twelve principals who took part in the study. In Chapter Five, a summary of the study and conclusions drawn from the findings as well as recommendations for further study were presented.

Chapter Five: Conclusions and Recommendations

President Johnson declared a war on poverty and used ESEA to help improve the greatly diverse educational systems in the United States (LBJ Library and Museum, 2009). President Obama, in 2010, called for a revision to ESEA to ensure all students are college and career ready when the students leave high school (Anderson, 2010a; Anderson, 2010b; Robelen, 2010). Poverty has been an acknowledged national problem for years. This study identified specific mathematics content strands where the achievement gap existed. A summary of the study, responses to the research questions, conclusions, implications for practice, and recommendations were presented in this chapter.

Summary of the Study

The purpose of the study was to explore the achievement gap in mathematics for elementary students. Specifically, the gap between the students' scores who attended a school with a F/R percentage below 25% and students' scores who attended a school with a F/R percentage above 75% was explored. Additionally, the focus of this study was to examine the mathematical strands with the greatest difference in achievement between the two groups. Identification of specific achievement gaps in mathematics could lead to a more individualized program of instruction and focused curriculum for students in poverty and those who are not performing at the same level as peers. There are not abundant resources on the socioeconomic achievement gap as it pertains to the mathematics content strands. However, much of the information and strategies about poverty can be applied to each of the content strand areas. As each of the causal factors for a gap in achievement becomes more evident, and there are more strategies to implement.

There exists an achievement gap between students who attended a school with a high percentage of poverty and those who attended a school with low percentage of poverty (NCEE, 2007; USDOE, 2009b). Researchers have examined how students living in poverty develop learning strategies to assist in the comprehension of mathematics (Jensen, 2006, 2009; Payne, 2007). Also, the works of Vygotsky (1993), Dewey (1954), and Piaget (1950) contributed to understanding the processes of learning, the stages of learning, and early research into the differences between students.

The uses of government funds to help overcome socioeconomic achievement gaps have demonstrated the national concern for preventing a further separation of the socioeconomic classes (Johnson, 1964; USDOE, 2009). Title I was a program created by President Johnson’s endorsement of ESEA of 1965, which provided funding to address the differences in education for students depending on socioeconomic classification (Walker & Mohammed, 2008). With the passing of NCLB, independent agencies have been hired to track Title I successes and areas of improvement (NCEE, 2007; USDOE, 2009b). These agencies track how the money is dispersed by the national agency, the success of the schools which received funding, study data on tests, and teacher quality (NCEE, 2007; USDOE, 2009b).

Szabo (2010) and Yen (2010) found over 20% of children would be identified as living in poverty on the 2010 United States Census. Payne (2007) found the United States had a poverty rate nearly three times as high as any other western industrialized nation, and children living in single parent households are much more likely to live in poverty.

The Secretary of Education has called for educational reforms to help solve the civil rights situation of the American education system (“Civil Rights Leaders,” 2010; Williams, 2010).

Past studies all documented summer learning loss which can impact a student in poverty; these researchers found students maintain or improve upon the achievement gap during the school year, but it will increase over the summer as much as three grades by the time the students will enter high school (Benson & Borman, 2007; Long, 2008; Mathews, 2010; Swanson, 2007; Toppo, 2010; Von Drehle, 2010). Researchers found high poverty students in a school with a lower percentage of students in poverty will perform better than high poverty students in a high poverty school (McCrummen & Birnbaum, 2010; Harris & Herington, 2006; Rotherham, 2010; Schrader, 2009). Jensen (2009, 2010) identified how the brain is impacted during learning and how the brain of a child in poverty will develop and need attention differently than a middle class peer. Felton (2010) implied one of the reasons for an achievement gap was the way the students in poverty look at problems differently. Lubienski (2001a, 2001b) found students in high poverty schools were more likely to be taught mathematics by rote memory, while low poverty schools focus on the problem solving aspects of mathematics. The strategies which were identified as the most successful in closing the achievement gap were described as strategies in which teachers collaborate often and have high expectations for students (Jensen, 2009; Marzano et al., 2001; Schmoker, 2006; Williams, 2003).

Strategies have been identified to close the gap, with a specific focus these strategies could be more effective. To analyze the first hand data in the study; student test data were collected and placed into a spreadsheet which was used as a tool to sort the data for analysis. The spreadsheet software, Microsoft Excel, allowed for graphs and tables to be created to demonstrate different parts of the statistical landmarks. The landmark differences between the groups were used to identify the gaps between the student performances. Student test data are from reliable and valid sources as demonstrated through the testing companies' research and analysis (MODESE Public Information, 2009; Scantron, 2008, Renaissance Learning, 2009). Interviews were also conducted to provide a human perspective to the data which were used as the tool for comparison in this study (Driscoll & Brizee, 2010).

Data were presented to accept the null or alternative hypotheses associated with the research questions. Each of the principals who were asked to participate in the study agreed to do so. The demographic data for each of the tests and testing windows were summarized. The quantitative research questions were supported by student test score data. Also, a *t*-test to document significance, a Pearson *r* to demonstrate correlation, and a review of statistical landmarks documented trends in the data. The qualitative research questions were supported by the responses to the interview questions by the twelve principals who took part in the study.

Findings

The following research questions guided the study and informed the hypotheses.

Research question one. What difference exists in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

(H_0) There is no statistically significant difference in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

(H_1) There is a statistically significant difference in growth of student scores on the STAR Math between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

The researcher failed to reject the null hypothesis. The Non-Title schools started and finished at a higher point than the Title schools; in 2005-2006 the Non-Title schools ended with an average scale score 69 points higher than the Title schools. The difference was 119 points in 2006-2007 and 68 points in 2007-2008. When the growth for the Title and Non-Title was compared, two out of three years of the STAR Math test, the title schools out grew the non-title counterparts. It was at the most, a three point difference in the scores. There was a difference in the growth, but it was not significant.

Research question two. What difference exists in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

(H_0) There is no statistically significant difference in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

(H_1) There is a statistically significant difference in growth of student scores on the Performance Series between schools with a free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

The researcher failed to reject the null hypothesis. For the first year of the Performance Series Mathematics test, there was a difference in growth of 76 points between Title and Non-Title schools. However, there was only one Non-Title school in the study which tested in academic year 2008-2009, so there were not enough data to provide an adequate sample size. In academic year 2009-2010, when all of the schools in the study took the Performance Series Math test, there was a difference in average scores of less than nine points which was not a significant difference.

Research question three. What difference of student scores exists within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

(H_0) There is no statistically significant difference of student scores within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

(H_1) There is a statistically significant difference of student scores within the five mathematical strands on the Performance Series between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

The researcher failed to reject the null hypothesis. As earlier mentioned, academic year 2008-2009 only had four title schools and one non-title school which participated in the study that assessed with the Performance Series Math test. The sample size was not large enough to provide significant data for the study. For the Performance Series Math test EOY results in 2009-2010, the different in average scores ranged from 8.54 points in the algebra content strand to 10.17 points in the measurement strand. If this pattern was available over many academic years a difference between the five content strands could be easier to identify.

Research question four. What difference of student scores exists within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%?

(H_0) There is no statistically significant difference of student scores within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

(H_1) There is a statistically significant difference of student scores within the five mathematical strands on the MAP test between schools with free and reduced price meal population above 75% and schools with a free and reduced price meal population below 25%.

The researcher failed to accept the null hypothesis. There was a significant difference in the student scores in the content strands of number and operations, algebra, and measurement. Number and operations had differences in average scores ranging from 10.94 points in the 2006-2007 testing window to 14.42 points in the 2007-2008 testing window. Algebra had differences in average scores ranging from 11.15 points in the 2005-2006 testing window to 15.43 points in the 2007-2008 testing window. Measurement had differences in average scores ranging from 11.73 points in the 2008-

2009 testing window to 13.21 points in the 2005-2006 testing window. Both the geometry and data and probability content strands had large differences, but they were not as significant. Geometry had differences in average scores ranging from 8.1 points in the 2005-2006 testing window to 11.48 points in the 2008-2009 testing window. Data and probability had differences in average scores ranging from 9.38 points in the 2006-2007 testing window to 11.68 points in the 2008-2009 testing window.

Research question five. How do building level principals perceive the mathematical academic performance of students from high and low socioeconomic status?

In the interviews, many of the principals identified the differences in the basics of number and operation between title and non-title schools. This difference in number and operation was contributed to the difference in understanding for the algebra content strand. The principals discussed the Title student lacking life experiences when they come into school which would give them the knowledge of the language of math. The Non-Title principals discussed the students having to deal with numbers all of the time, or seeing their parents do so. Many of the principals also discussed that the students in a Title school did not have a solid concept of money, which the Non-Title students often had. This had to do with the use of allowance for the Non-Title students and seeing their parents handle money as well. Concepts of money fall under the measurement content strand. Based on the outcomes of research question number four, which found significant differences in the content strands of number and operations, algebra, and measurement, the principals had a good sense of what the differences between the students were in the mathematics classroom.

Conclusions

When looking at student growth within each school year, there was not a significant difference between title and non-title schools. The non-title schools had higher BOY average scores and EOY average scores than the title schools; however, the growth within each school year was not significantly different. Pockets of larger growth existed in several of the schools, but this may be accounted for by a group of students who learn at a different rate than peers in the grades surrounding them or a highly qualified teacher reaching more students.

When comparing the content strands, the principals interviewed had a good understanding of the differences between the students. All were aware of the basic knowledge of the mathematical language which students in poverty often lack when they enter school. The number and operation content strand students' scores supported this belief of the principals. The principals also discussed students in a low poverty school having a better concept of money, because the students are made aware of money before entering school by allowances and observation of parents. That was identified in the measurement strand. The principals also discussed students having difficulty with algebra because they are lacking the basics from number and operations to make the next step.

Title students scored lowest in algebra in four of the five years of the MAP test. However, this was also the lowest content strand for the non-title students three of the five years. For three of the five MAP tests, geometry had the highest content strand score for Title students. For Non-Title students, geometry and data and probability were each had the highest content strand for two of the five years. The students were very similar in strengths and weaknesses within the content strands

Researchers, such as Books (2004), Lubienski and Lubienski (2005), Payne (2007), and Williams (2003) have identified a gap in the learning of students of differing socioeconomic classes. That the gap exists was not a surprise; however, narrowing the focus of the gap to the specific content strands had not been discussed in depth by many researchers. This study found gaps in the numbers and operation, algebra, and measurement content strand. These gaps were mentioned by the principals in the interviews. The people who work with students everyday are aware of the differences and have theories on why the differences exist. Now, teachers and administrators, armed with the knowledge of the strands which require the largest amount of gaps to overcome can begin the work of closing the achievement gap.

Recommendations

In suggesting recommendations for further study the researcher believes this study would be enhanced by waiting for more data from the Performance Series. With more data from the Performance Series a longitudinal study could be conducted to identify the patterns which were available from the MAP test students' scores. Once more years of students' test scores are available, trends and patterns could be identified. Future researchers could further analyze the students' scores by grade level. Different trends in the students' scores could be identified by grade level, as well as the different rates at which students develop academically.

A larger scale analysis of the achievement gap to look for trends in the content strands could be attempted. Many reports exist for the achievement gap based on either race or socioeconomic status or a combination of the two. When the common state standards are in place in 2012-2013, the availability of large numbers of students who are assessed with the same tool will be open to analysis. This could lead to a larger study than previously completed with NAEP data.

Many students live in a constant state of poverty, where many have to worry about having basic needs met, not homework or test scores (Fay & Fay, 2009). Johnson (1965) called for overcoming poverty and closing the achievement gap, but educators are limited in fixing national issues. Rothstein (2008) called for more government programs, raising the minimum wage, and providing housing. Educators do not have the power to make these changes; instead, the problem of poverty can be solved one student at a time. Educators can assist in developing the students' knowledge, skills, and confidence which is needed to overcome the challenges of daily life. Through education and providing a safe place to students to develop, educators can provide the tools for students to change their own world. Society has to make the education system the best for students taught in schools and provide the tools these students living in poverty need to escape the challenges students face daily.

The focus of this study was the socioeconomic achievement gap as it pertains to the mathematics content strands. The gaps have been identified in the areas of numbers and operations, algebra, and measurement. The ways in which educators can help students to overcome these gaps are to give the students the skills to overcome poverty. Students are behind in numbers and operations due to not having the experience in developing the language of mathematics as the student prepares for an education in the preschool years. Parents in poverty either do not have the skills or time to develop this ability in their own children, so the students come to school behind in skills.

Once a student is behind in numbers and operations it is going to lead to the students being behind in the algebra strand. This is because the numbers and operations strand builds the foundation for the algebra strand. The measurement strand is the third strand which has a significant difference between Title and Non-Title schools. The measurement strand deals with time, money, lengths, and weights of objects. Students in poverty may not gain experience dealing with time, money, or the use of measurements before going to school. The way to help close the achievement gaps in the three content strands is to help the students overcome the situations faced everyday in poverty.

There are many ways in which educators can lay the groundwork for students to escape poverty. First, start early and provide a year-round calendar starting in pre-kindergarten (Harris & Herrington, 2006; Riley 2010b, 2010c). As evident from the differences in growth, students in poverty grew academically, as documented by scores on achievement tests, as much as students not in poverty during the school year (Mathews, 2010; Swanson, 2007; Toppo, 2010; Viadero & Johnston, 2000; Von Drehle, 2010). However, when students in poverty stay home over the summer, they may not have any enrichment activities to help them prepare for the upcoming school year. The gap existed when students enter school, narrows during the school year, and then grows over the summers (Boyd-Zaharias & Pate-Bain, 2008; Harris & Herrington, 2006; Mathews, 2010; Swanson, 2007; Toppo, 2010; Viadero & Johnston, 2000; Von Drehle, 2010). If a child in poverty is given an extra year of organized learning, it will decrease the time at home and decrease the gap when the student enters first grade. If children are in school year-round they will also have access to at least two meals more often than the traditional 170-180 day calendar.

A second way to help students escape poverty is to support teachers who work in schools with high percentages of F/R students by offering additional pay. Many schools with large percentages of F/R students do not have large numbers of experienced teachers (NCEE, 2007, USDOE, 2009). Often, teachers come to these schools to gain experience as a stepping stone into higher paying districts (NCEE, 2007, USDOE, 2009). Districts need to help maintain a stable environment for students in poverty at school by honoring the teachers who work in these schools with pay to support the extra work they do each day (NCEE, 2007, USDOE, 2009).

Another way in which to offer support for students escaping poverty is to provide busing for all students (Boyd-Zaharias & Pate-Bain, 2008; Rotherham, 2010). Busing could also be available to help students stay at the same school if they move within a district (Boyd-Zaharias and Pate-Bain, 2008; Rotherham, 2010). The transience of students impacts learning loss and continuity of education (Boyd-Zaharias and Pate-Bain, 2008; Rotherham, 2010). If a child moves at the end of the month due to an eviction, the district can provide busing services to make sure the education of the students is maintained (Boyd-Zaharias & Pate-Bain, 2008; Rotherham, 2010).

Finally, a way to help students overcome poverty is to attack the specific strands in which the gaps exist. This study found statistically significant gaps over a five-year period on the MAP test in number and operations, algebra, and measurement. Students living in disadvantaged socioeconomic situations need more exposure to mathematical activities. Researchers such as Jensen (2009), Marzano et al. (2005), Schmoker (2006), and Williams (2003) have offered many strategies and plans to help students achieve.

Providing students and their families the opportunity to experience concrete learning is a way to expose these students to a deeper understanding of the difficult content strands.

Poverty is not a problem that can be solved in a matter of seconds, minutes, hours, days, years, or perhaps even decades. However, poverty can be solved one student a time. Schools which serve a high percentage of students in poverty need help to provide the students the tools they need to escape poverty.

Summary

Yen and Sidoti (2010) noted poverty and the achievement gap related to socioeconomic differences are problems at all levels of the country: national, state, and local. With the percentage of students living in poverty rising and the number of children in poverty expected to rise to nearly 20%, addressing the gap has become more important as the economic outlook worsens (MSNBC.com, 2009b; Yen & Sidoti, 2010). Understanding the connection between student performance and socioeconomic status is important in identifying the gaps in performance on standardized tests (NCES, 2007b). The gap between students of high and low socioeconomic status has been a focus for the national government for many years; President Lyndon Johnson passed the first ESEA (LBJ Library and Museum, 2009). In 2010, President Barrack Obama pushed for a revision of the current ESEA (Anderson, 2010a; Anderson, 2010b; Robelen, 2010).

The purpose of the study was to explore the achievement gap in mathematics for elementary students. The gap between the students' scores who attended a school with a F/R percentage below 25% and students' scores who attended a school with a F/R percentage above 75% were explored. Also, the focus of this study was to examine the mathematical strands with the greatest difference in achievement between the two groups.

The data collection instruments used in the study were the three testing systems: the STAR Math test, Performance Series, and the MAP test. Data were collected at various times; the interviews were conducted in October and student score data were requested in November. The data were collected from the following time periods: STAR Math, 2006-2009; Performance Series, 2009-2010; and MAP, 2006-2010. The data were sorted by test; within each test the data were divided into years, and each year was divided by schools.

In the design of the study, two tests were used to create inferential statistics. The Pearson *r* is a tool used to identify comparative analysis which was used to study the student test scores in schools with a F/R of greater than 75% and less than 25%. The *t*-test was used to study and compare the students' test scores for significance. Additional descriptive statistics were used to further support the research questions. Interviews were conducted as a qualitative method to study the perceptions and beliefs of principals who lead a school with a F/R percentage above 75%, and a F/R percentage below 25%. Finally, statistical landmarks were used to provide background for the data such as mean, maximum, minimum, and standard deviation (Trochim, 2006b).

In this study, the difference in growth was not noted between students in Title schools and students in Non-Title schools. This seems to indicate the gap exists when students enter school and expands over summer vacations (Boyd-Zaharias & Pate-Bain, 2008; Harris & Herrington, 2006; Mathews, 2010; Swanson, 2007; Toppo, 2010; Viadero & Johnston, 2000; Von Drehle, 2010). Differences were found in the content strands, most notably number and operations, algebra, and measurement. The principals who were interviewed noted these differences and believed it was caused by lack of experience when students enter school. These students lack experiences, such as families spending time playing games to teach basic number concepts or involving children, before they enter school. Including students in discussions about baking or shopping where numbers can be used is a way to help the students develop number sense. The principals also believed students in higher socioeconomic situations tended to be given an allowance and have to learn to manage money on their own. The educational community is aware an achievement gap exists and has identified more specific information about the gaps in this study. Now as educators concerned with students and their future need to address these discrepancies.

To overcome the achievement gaps in the mathematical content strands, the educational community needs to address the differences created by poverty. However, the problem of poverty cannot be fixed entirely within one generation. Poverty or class systems have been around since the cradles of creation (Guisepi, 2006). Poverty can be solved for one student at a time, giving the student tools to overcome the current living conditions. By providing preschool, year-round schooling, and incentives to recruit and retain high-quality teachers, the first steps to helping students escape poverty will have been taken.

Appendix A

District Request to Conduct Research

[redacted]

REQUEST FOR APPROVAL TO CONDUCT RESEARCH

The [redacted] district encourages educational research by departments of the school system, advance degree candidates, agencies and institutions of higher learning. All research projects to be conducted in the schools must have prior approval by the [redacted] Research Review committee. The following instructions identify the forms/documents that must be submitted and describes procedures of the approval process.

I. Application for Request for Approval to Conduct Research

1. Name of Researcher: ______________________________Date: ___________________

2. Business Address of Researcher (City/State, Zip Code)

____

____

3. Email Address: ____

4. Telephone Numbers: (Area code and daytime phone number) _______________________

(Area code and work phone number) _________________________

5. Reason for conducting research:

a. ______ Necessary to complete a Masters level graduate course
b. ______ Necessary to complete the requirements for a Masters degree
c. ______ Necessary to complete the requirements of a Specialists level graduate course
d. ______ Necessary to complete the requirements for a Specialists degree
e. ______ Necessary to complete a Doctoral level graduate course
f. ______ Necessary to complete the requirements for a Doctorate degree
g. ______ Necessary to complete research for a community project

*(*Note: If the requested research is a component of a grant application for an outside agency or community group, contact with the Quality Improvement & Accountability department should be made prior to grant submission.)*

6. Name of participating institution/agency: _______________________________________

7. Name of Research Advisor or Project Director ___________________________________

Telephone Number: ________________________ Email: _________________________

8. Advisory or Project Director Signature ____

9. If your research proposal requires specific district data, please provide a brief description of your data needs:

____

____

CONDITIONS FOR MAINTAINING ANONYMITY AND SHARING PROJECT RESULTS

I agree to maintain the anonymity of individual students, staff members and schools in any report(s) and in any publication(s), e.g., journal articles(s), book(s), etc., which incorporate any information derived from the research conducted within the [redacted]. If permission is granted to conduct the research described is this request, I verify the research will be conducted in compliance with all federal and state statutes and the policies of the [redacted]. I agree to provide the Quality Improvement and Accountability Department with a summary of the research results, complete documentation and information on the location of the complete research and, in the future, subsequent publications.

______________________________ ______________________

Signature of the Researcher Date

II. Directions for Application:

1. This form must be completed to satisfy [redacted] Administrative Practice and Procedures 6.24 "Requests to Conduct Research."
2. The University advisor/organization administrator must sign this request. He or she will accept direct responsibility related to research activities.
3. Five copies of this form and five copies of all requested documents and attachments must be submitted.
4. The researcher may contact participating schools and/or departments for data collection only after the form has been officially approved by the district Research Review committee.
5. Application packets received at *least one week* before the Research and Review committee's monthly meeting will be reviewed.

III. Guidelines:

1. Researchers may request to do research with specific staff members or buildings and efforts will be made to honor these preferences.
2. Data derived from tests, school records, interviews, or survey/questionnaires, which have potential for invasion of privacy of students or their families, must have advanced written authorization of parents or guardians. These releases will be collected and filed with the building principal before the project is initiated.
3. Personnel records of the school staff are confidential and information will not be released from these records.
4. Public information will be available to researchers and other interested parties, but if time or other expense is involved, the requesting party will be responsible for such costs.
5. Instructional activities will not be interrupted unless there is clear significance for the improvement of educational programs in the [redacted].
6. Decisions of the committee will be granted within two weeks of formal review of the proposal. Please note formal review occurs at monthly committee meetings.
7. Should a request be denied the applicant will be offered an opportunity to make corrections/submit further documentation for review. Resubmitted requests will be subject to formal review and issued a decision within two weeks of the monthly committee meeting.
8. A copy of your final research report will be submitted to the Quality Improvement & Accountability department.

IV. Please attach the following documentation with your completed Request for Approval to Conduct Research form:

- Research Title
- Purpose
- Methodology
- Statement of Problem
- Hypothesis and/or Research Questions
- Description of variables
- Description of Sample
- Method of Sample Selection
- Data Collection Instruments (if applicable)
- Data Collection Timetable
- Samples of Consent forms (if applicable)
- Names of participating schools
- Identification of target population (i.e. teachers, administrators, students, grade levels, and expected number of participants)
- Anticipated Start Date of Research
- Completion Date of Research
- Copy of Institution of Higher Learning Internal Review Board (IRB) application form approved and signed.

Return this completed form and supporting documentation to:
Quality Improvement & Accountability
[redacted]

Appendix B

[redacted] Exists For the Academic Excellence of All Students

Quality Improvement & Accountability Office

To: Adam Meador

From: Research Review Committee

Date: October 11, 2010

Subject: Request to Conduct Research

Your request to conduct research proposal titled, "*The Socioeconomic Gap in Mathematics*" submitted for consideration has been approved by the [redacted] Research Review Committee.

This approval is contingent upon willingness of district personnel to voluntarily participate in your study and the IRB approval from your agency or institution of higher education supporting your research.
We request the results of your study be submitted to the SPS Research Review Committee upon completion.

Feel free to contact [redacted] if you have questions or need additional information.

Good Luck.
[redacted] Research Review Committee

Appendix C

11-09
IRB Project Number

Lindenwood University
Institutional Review Board Disposition Report

To: Mr. Adam Meador
CC: Dr. Sherry DeVore

The IRB has reviewed your application for research, and has approved it without reservation

Ricardo Delgado 9/10/10
Institutional Review Board Chair Date

Appendix D

Lindenwood University

School of Education
209 S. Kingshighway
St. Charles, Missouri 63301

<Principal Interviews>

Informed Consent for Participation in Research Activities

"The Socioeconomic Achievement Gap in Mathematics"

Principal Investigator: Adam Meador
Telephone: 417-838-6128 E-mail: akm169@lionmail.lindenwood.edu

Participant ________________________________ Contact info _____________________

1. You are invited to participate in a research study conducted by Adam Meador under the guidance of Dr. Sherry DeVore. The purpose of this research is to identify the socioeconomic achievement gaps within the five mathematical strands.
2. a) Your participation will involve:

   - Answering open-ended questions about the achievement of students in your building. Questions will involve strengths, weaknesses, and greatest challenges for the students.

   - The interviews will be conducted in person and audio-taped for accuracy.

   ***I give my permission for the interview to be audio-taped (participant's initials_____).**

   b) The amount of time involved in your participation will be approximately 30 minutes.

   - Approximately 12 Elementary Principals will be involved in this research.
3. There are no anticipated risks associated with this research.

4. There are no direct benefits for you participating in this study. However, your participation will contribute to the knowledge about the socioeconomic achievement gaps in the area of mathematics.

5. Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions that you do not want to answer. You will NOT be penalized in any way should you choose not to participate or to withdraw. All recordings will be conducted off campus.

6. We will do everything we can to protect your privacy. As part of this effort, your identity will not be revealed in any publication or presentation that may result from this study, and the information collected will remain in the possession of the investigator in a safe location.

7. If you have any questions or concerns regarding this study, would like a copy of the results, or if any problems arise, you may call the Primary Investigator, Adam Meador, 417-838-6128 or the Supervising Faculty, Dr. Sherry DeVore, 417-881-0009. You may also ask questions of or state concerns regarding your participation to the Lindenwood Institutional Review Board (IRB) through contacting Dr. Jann Weitzel, Vice President for Academic Affairs at 636-949-4846.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my participation in the research described above.

____________________________________ ____________________________________

Participant's Signature Date | Participant's Printed Name

____________________________________ ____________________________________

Primary Investigator's Signature Date | Primary Investigator's Printed Name

Appendix E

Letter of Introduction

<Principal Interview>

<Date>

<Title> <First Name> <Last Name>
<Position>
<School>
<Address>

Dear <Title> <First Name> <Last Name>,

Thank you for participating in my research study, *The Socioeconomic Achievement Gap in Mathematics*. I look forward to speaking with you on <date> <time> to gather your perceptions and insights as to the academic performance of students in the area of mathematics. I have allotted 30 minutes to conduct the interview.

Enclosed are the interview questions to allow time for reflection before our interview. I have also enclosed the Informed Consent Form for your review and signature. Your participation in this research study is voluntary and you may withdraw at any time. Confidentiality is assured.

If you have questions, please call 417-838-6128 or e-mail akm169@lionmail.lindenwood.edu. Once this study has been completed, the results will be available to you by request.

Sincerely,

Adam Meador
Doctoral Candidate
Lindenwood University

Appendix F

Interview Questions for Building Level Principals

1. Have you been an administrator or teacher in both a title school and a non-title school?
2. Is your school identified as a title school or non-title school?
3. What is the percent of F/R in your building?
4. Which of the math strands do you believe cause your students the most difficulty (The mathematical strands are: algebraic relationships, geometric and spatial relationship, data and probability, measurement, and number and operations)? Why?
5. What are your students able to do with great success during mathematics while in the classroom?
6. In regard to understanding the concepts of mathematics, what do you believe sets your students apart from peers in other schools across the district?
7. What challenges must your teachers overcome in order for mathematics learning to take place?
8. What challenges must your students overcome in order for mathematics learning to take place?
9. What do you believe is the difference between the mathematical knowledge of the students in a title and non-title school?

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Vita

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