THE EFFECTS OF SOCIOECONOMIC STATUS ON GROWTH RATES IN ACADEMIC ACHIEVEMENT

Priscilla En-Yi Chow, B.S., M.Ed.

Dissertation Prepared for the Degree of

DOCTOR OF EDUCATION

UNIVERSITY OF NORTH TEXAS

December 2007

APPROVED:

William E. Camp, Co-Major Professor
Jimmy K. Byrd, Co-Major Professor
James D. Laney, Minor Professor
John C. Brooks, Committee Member
Richard Fossey, Program Coordinator
Leslie A. Patterson, Chair of the Department of Teacher Education and Administration
M. Jean Keller, Dean of the College of Education
Sandra L. Terrell, Dean of the Robert B. Toulouse School of Graduate Studies

Chow, Priscilla En-Yi, The effects of socioeconomic status on growth rates in academic achievement. Doctor of Education (Educational Administration), December 2007, 143 pp., 24 tables, 2 illustrations, references, 146 titles.

The purpose of the study was to examine the differences in academic growth rates as demonstrated on the TAKS test among students based on those who received free lunches, those who received reduced-price lunches, and those not economically disadvantaged. Texas Assessment of Knowledge and Skills (TAKS) for reading and mathematics scale scores were obtained from five Texas public school districts for students who were in 3rd grade in 2003, 4th grade in 2004, 5th grade in 2005, and 6th grade in 2006. The sample included almost 10,000 students. The data were analyzed using SPSS and HLM. SPSS was used to identify descriptive statistics. Due to the nested nature of the data, HLM was used to compare data on three levels- the test level, student level, and district level. Not economically disadvantaged students scored the highest on both TAKS reading and mathematics exams with a mean scale score of 2357 and 2316 respectively in 2003. Compared to the not economically disadvantaged students, students receiving reduce-priced lunches scored approximately 100 points lower, and lowest were the students receiving free lunches, scoring another 50 points below students receiving reduced-price lunches. The results revealed that while gaps in achievement exist between SES levels, little difference exists in the growth rates of the SES subgroups. The results of this study support the need for continued effort to decrease the gap between students who are not economically disadvantaged and those receiving free or reduced-price meals.

ACKNOWLEDGEMENTS

Sincere appreciation is extended to the following individuals, whose thoughtful consideration and generous assistance allowed for completion of this dissertation.

My husband, Tom Chow, whose encouragement from the day we met has sparked me to always strive for a more fulfilling life. Your unwavering support and belief in me has made it possible to accomplish this feat.

My sons, Max Chow and Mason Chow, whose hugs and smiles have given me huge incentives to complete my doctorate.

My parents, Dr. and Mrs. Christopher Chang, who have always taught me that education is invaluable, working hard is important, and faith in God is first and foremost.

Major professor Dr. William Camp, whose guidance and support for many years was the key to moving me along to graduation.

Major professor Dr. Jimmy Byrd, whose high standards and quest for excellence inspired me to always do my best.

Minor professor Dr. James Laney, whose love of life reminded me to always keep a balance and enjoy the people around me.

Committee member Dr. John Brooks, whose concern for others has shown me that it is important to get to know people on a personal level.

Finally, appreciation is given to the school districts and district personnel who helped to provide the data and information I needed to complete this study.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Economically disadvantaged students lagged behind their peers approximately 14-and-a-half months in reading and mathematics (Wong, Meyer, & Shen, n.d.). Recent trends in education, demography, and the economy have made the achievement gap a high priority (Kober, 2001). The *Atlantic Monthly* reported a child growing up in a family earning over $90,000 a year had a one-in-two chance of getting a college degree by age 24 compared to a child in a family earning under $35,000, with only a one-in-17 chance (Brooks, 2005). The issue was not simply the inability to pay the tuition. Children from poverty did not have the ability or skills to thrive in college life. They lacked cultural capital, which includes academic competence, practical competence, economic confidence, and social confidence. Academic competence was low for poor children because they often graduated from high schools that prepared them only to the eighth-grade level (Brooks, 2005). Practical competence related to a lack of understanding for the need of a college degree. From an economic perspective, low-income students were often intimidated by the costs of college. Socially, poor students felt more uncomfortable and out of place in college and, ultimately, dropped out of school (Brooks, 2005).

K-12 education should prepare children to be contributing members of society. However, children in poverty continue to struggle as they are less successful in school when compared to their more affluent peers. All children deserve an education in which they have the option to attend college; the aspects of cultural capital must be present so that all students have a chance at success.

Many studies (Higgins, 2006; Mulvenon, Ganley, & Fritts-Scott, 2001; Carmichael, 2005) have investigated the academic achievement of students from low socioeconomic status, but no longitudinal studies have been conducted to compare academic achievement of students receiving free lunches versus those receiving reduced-price lunches (Paris, 2003; Sorhaindo, 2003). This study analyzed the difference in achievement among three groups of students based on their socioeconomic levels: students receiving free lunches, students receiving reduced-price lunches, and students not eligible for lunch assistance. Using the results of the Texas Assessment of Knowledge and Skills (TAKS) from major suburban school districts, the researcher identified achievement gaps in reading and mathematics. Knowing where these achievement gaps exist is important in assisting educators to help children in poverty achieve their potential. In addition, politicians and administrators need to identify the gaps so policies can be changed and education reformed.

Background of the Study

Thirty-four percent of children in the United States have spent at least one year in poverty (Seccombe, 2000). A third of all children have struggled without adequate food, shelter, and clothing. Almost 20% of children entering American kindergartens have experienced substandard housing, food insecurity, chronic dental or health problems, or lack of school supplies such as pencils and paper (Carmichael, 2005). According to Maslow's hierarchy of needs, children cannot learn new information until their fundamental requirements have been met (Huitt, 2004).Thus, children in poverty did not achieve academically because they worried about where they would sleep, what they would eat for dinner, and whether their mothers would be home at night.

The National School Lunch Program (NSLP), a federally assisted meal program for children in schools, uses the United States Department of Health and Human Services (HHS) poverty guidelines to qualify students for discounted lunch prices (Rosso & Weill, 2004). Students qualify for free or reduced-price lunch prices based on their family income (USDA Food and Nutrition Service National School Lunch Program, n.d.). The U.S. Government sets guidelines based on the minimum amount required to meet the basic material needs to live (Carmichael, 2005). For the 2002-2003 school year, every day approximately 16 million of the 27.8 million children who ate school lunches received free or reduced-price lunches (Rosso & Weill, 2004). This study used the free and reduced-price lunch qualifications to distinguish the three groups of students which were compared in the area of academic achievement.

The United States Department of Education (2004) has identified academic achievement gaps between low socioeconomic status (SES) and not economically disadvantaged students. Starting from a young age, low-SES children have the odds stacked against them. They have slower language acquisition, literacy development, achievement in reading comprehension, and success in academics (Barton, 2003). After children entered elementary school, the differences in achievement widened (Borman, 2002). Lower SES students scored poorly on state and national tests.

For example, data from Great City Schools (Eisner, 2001), which include large city schools and have 62.9% of the student body eligible for free lunch (Casserly, 2004), revealed that students from low-SES backgrounds scored below high-SES students. In reading comprehension for fourth grade, students in moderate to high poverty schools attained 18.2 points below students attending schools at average economic levels. In mathematics, students in fourth grade scored 15.7 points below students attending schools at average economic levels (Eisner, 2001). A family's income impacted academic achievement, with a wide achievement gap between students who were economically disadvantaged and students not economically disadvantaged.

Beginning with preschool, poor and low-income children more likely attend early childhood programs of lower quality. Classrooms comprised of 60% of children from low-income homes had significantly lower quality indicators of teaching, teacher-child interaction, and materials for learning than classrooms with fewer low-income children (Klein & Knitzer, 2007). Students who attended high poverty schools were twice as likely to be at risk for dropping out of school. In schools with more than 40% of the students in poverty, a sharp decline in student achievement was found (WCPSS Evaluation and Research Department, 1999).

The school's SES composition was also a factor in student achievement. Caldas and Bankston's (1997) findings from the grade 10 Louisiana Graduate Exit Examinations indicated a strong tendency for poor children to attend schools where the other students were also poor. In terms of academic achievement, the SES of these students had a negative effect. Thus, poor children who attended a school with a significant number of poor students attained less on assessments.

A child's ethnicity also related to socioeconomic status and academic achievement. Shannon & Bylsma (2002) stated that minority students, mostly Hispanic and African-American, comprised the majority of the children in poverty. The discrepancy in performance between minority students and White students in the core academic subjects correlated directly with low-SES students found in the nation's poorest urban schools (Education Trust, 2005b). For mathematics and reading, the students who achieved the highest were White students who paid full price for their lunches, and the lowest achieving were the African-American students receiving free or reduced-price lunches (Thompson & O'Quinn, 2001).

From infancy, the family background of children was imbedded in their persona. The inequalities from childhood, including home, neighborhood, and peer environments, were issues students would face into adulthood (Berliner & Biddle, 1995). Quality education should be provided to all children regardless of ethnicity, socioeconomic status, or gender. In order to help children find success, education should include the elements of cultural capital: academic competence, practical competence, economic confidence, and social confidence.

Purpose of the Study

All children deserve a high-quality education. Public schools should meet the needs of all children regardless of their family socioeconomic status. Higgins (2006) stated that additional studies were needed to determine if the degree of children's SES affected achievement. The majority of the studies in the past differentiated between students who were poor versus those who were wealthy. This study analyzed the difference in achievement among three groups of students based on the NSLP lunch discounts. The three groups of students represented separate economic levels. Students receiving free and reduced-price lunch prices were considered economically disadvantaged, low income, and low-SES. Students receiving no lunch discounts were considered not economically disadvantaged. By looking at these groups specifically, the depth of poverty was compared to the achievement level of students.

Understanding the achievement and abilities of students in poverty and students of wealth is important to planning school programs. Educators require accurate information about the capabilities and needs of various groups of learners. Superficial understanding of achievement could lead to practices built on faulty assumptions (Higgins, 2006). Implementation of the appropriate school programming will lead to success for all students.

The author of this study analyzed the TAKS results in reading and mathematics to determine if differences existed in achievement among three economic groups. TAKS was first administered in 2003. To track the differences in growth rates of students, the third-grade students from 2003 were examined each year until they were sixth-grade students in 2006. Longitudinal studies were preferred over cross-sectional studies in order to evaluate change over time.

While research studies (Higgins, 2006; Mulvenon et al., 2001; Carmichael, 2005) have shown there was a difference in achievement between children in poverty and those from wealth, few differentiated between students who received reduced-price and free lunches. This study examined data to determine if a difference in growth rates over time for reading and mathematics achievement among students eligible for free lunch prices, students eligible for reduced-price lunches, and students not economically disadvantaged existed.

Research Questions

To explore the differences in student achievement among the three defined economic levels, the author addressed the following research questions:

1. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?
2. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
3. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?
4. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?
5. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?

6. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?

Significance of the Study

The low socioeconomic status (SES) child should be provided the same quality education as that of a child of high SES. Kober (2001) states, “State and national leaders have begun to recognize that the nation cannot raise standards and improve student achievement without closing the achievement gap” (p.9). Large gaps in academic achievement between high- and low-SES children have formed (Kober, 2001). The nation’s economic strength and social unity rely on all children being well-educated (Kober, 2001). Thus, identifying the achievement growth rates of children in Grades 3 to 6 will help to begin closing the gap.

Limitations of the Study

The limitations of the study included threats to internal validity. This study was a comparative analysis of three different groups of students and their achievement. However, there was difficulty in controlling the history. Because of the use of students across Texas, it was difficult to assume that all students obtained the same quality of education. The participating students were enrolled in five different school districts, attended a number of different schools, and learned from many different teachers. While Texas has established its own curriculum, Texas Essential Knowledge and Skills (TEKS), the implementation of the curriculum varies from teacher to teacher, school to school, and district to district. In order to teach the curriculum, districts had the option to select textbooks and materials from several vendors. In addition, some school districts purchased programs to expedite the learning of children. These additional programs helped to boost reading and mathematics achievement through rote learning or continuous practice. Regardless, the varied methodology of teaching the TEKS has been a factor in academic achievement. Thus, limitations were found in the implementation of the TEKS. The school district personnel, principal, and, ultimately, the teacher hold the responsibility for implementation of the curriculum.

To some extent, there was test bias. The teachers had the same test administration training only if they were at the same school and were being trained by the same person at the same time. While there were set procedures for administering the TAKS test, not all procedures were interpreted exactly the same, and some teachers might have been more lax with the administration than others.

Another variance occurred in the number of students taking the test together. A select number of students who qualified were allowed to have the exam administered one-on-one or in a small group. These students must have had an accommodation on a regular basis when they take other exams at school. Other accommodations included document transcribing (an adult marks the bubble document for the child) or oral administration (for mathematics only). In most cases, students qualifying for these accommodations were students in special education or under Section 504.

When using Hierarchical Linear Modeling, 25 to 30 clusters are recommended. However, the research had only five clusters or school districts. Determination of whether the smaller number of clusters has impact on the statistical significance will be found.

Delimitations of the Study

The following delimitations or threats to external validity applied to this study:

1. Not all children from low socioeconomic status were at that level for the same reason. For instance, one child might be of generational poverty, while another child might be poor due to a situation, such as loss of job.
2. Also a child's socioeconomic status might not remain the same for the entire four years in which the study took place. Data from 2003 were used to establish group membership for this study, even if a student's economic status changed after 2003.
3. The quality of teaching could not be held constant. It was unlikely that any two children in the study had the same teachers from 2003-2006. Thus, it was unlikely that any two children received the exact same education.
4. Only the score on the first TAKS test administration was used for Grades 3 and 5. Students in third and fifth grade levels had three opportunities to pass the reading exam. Fifth-grade students also had three opportunities to pass the mathematics exam. If the child did not pass the third time, a committee was formed to discuss the child's retention or promotion to the next grade level. Thus, hopefully, a child improved on each administration of the exam. For the greatest consistency, only the first administration's score was counted in this study.

Definition of Terms

Achievement gap- Achievement gap was the difference in achievement on either the reading or mathematics test among the student subgroups based on socioeconomic status.

Economically disadvantaged- Students who received free or reduced-price lunches were considered economically disadvantaged. In this study, economically disadvantaged children were also considered low-SES or in poverty.

Scale score- The TAKS test results were given in scale scores. A scale score compared scores with the standards and took into consideration the differences in the difficulty of the test variations for each administration (TEA, 2005a).

Socioeconomic status (SES)- A child's socioeconomic status was based on his economic level. The three socioeconomic status groups included in this study were students receiving free lunches, students receiving reduced-price lunches, and students who were not economically disadvantaged. These groups were compared with each other to identify any achievement gaps. Generally, if a child qualified for free or reduced-price lunch, then the child was considered low SES. In contrast, if the child did not qualify for a discounted lunch price, he was deemed not economically disadvantaged.

Texas Assessment of Knowledge and Skills (TAKS)- The TAKS was the Texas assessment which evaluated all public school children's progress starting in third grade. For this study, only reading and mathematics were tracked for children from the 2003 through the 2006 administrations of the exam. Other subject areas were not analyzed.

Major suburban school district- Texas has categorized school districts as several types. The school districts included in this study are all considered major suburban school districts. Major suburban districts were defined as located contiguous to major urban districts. Suburban districts that were not contiguous had a student population of at least 15% of a district designated as major urban school district (Texas Education Agency [TEA], 2004).

Summary

All children should receive an equal education regardless of their socioeconomic position in society. With an education, the possibility of leaving poverty increases greatly

(Payne, 2005). Educators have always hoped to see students improve academically and succeed in life. Comparing student TAKS scores from three socioeconomic levels of children show whether a gap in achievement existed. If a gap exists, then educators should find ways to help close the gap and raise achievement for children struggling to succeed.

This study will help educators have a better understanding of children in poverty and their abilities. The researcher analyzed data to answer questions as to whether children in poverty achieved as much as their peers or whether children in poverty achieved at the same rate. All children need a quality education because the United States's economic strength and social cohesion depends on all children being well-educated (Kober, 2001). In order for the United States to continue being a strong nation, everyone, including educators, students, policymakers, parents, and community members, must take responsibility to close the gap (Kober, 2001).

Organization of the Study

This study contains five chapters. Chapter I, the introductory chapter, provides background information for the study, the purpose of the study, research questions, and significance of the study. Chapter II focuses on a review of the past literature and research related to the academic achievement gap in reading and mathematics. Chapter III describes the methodology and research process for the study. It includes information on the design of the study, research subjects, sources of the data for the study, and procedures used for analyzing the data. The results of the study are shown in Chapter IV. The final chapter, Chapter V, includes the discussion of the results and recommendations for future studies.

CHAPTER II

LITERATURE REVIEW

Carmichael (2005) stated that approximately one fifth of all children who enter through the public school doors in America have experienced issues related to poverty. A child in poverty lived in substandard housing, had food insecurity or hunger, suffered from chronic dental or health problems, or had insufficient funds for basics such as pencils and paper (Carmichael, 2005). Family background continued as the single strongest predictor of educational outcomes (Fransoo, Ward, Wilson, Brownell, & Roos, 2005). Regardless of a child's wealth level, his education should be equal to any other child's. Ideally, a child in poverty should have the same achievement level as his peers, but, in reality, they have lower achievement due to the factors of living in poverty.

The purpose of this study was to analyze the difference in achievement growth rates over time among three groups of students based on their socioeconomic levels: students receiving free lunches, students receiving reduced-price lunches, and students not economically disadvantaged. Using the Texas Assessment of Knowledge and Skills (TAKS) results from suburban school districts, achievement gaps were identified for reading and mathematics. Most studies (Higgins, 2006; Mulvenon et al., 2001; Carmichael, 2005) examined socioeconomic status (SES) and academic achievement for the effects of high versus low SES. No studies in the past analyzed data longitudinally for differences in achievement rates between students receiving reduced-price lunch and students receiving free lunch.

Poverty Defined

Seccombe (2000) determined that 34 percent of all children in the United States spent at least one year in poverty. A third of all children struggled through days without adequate food, shelter, or clothing. The United States Department of Health and Human Services (HHS) sets poverty thresholds and guidelines to define poverty. Each year the Census Bureau has updated the poverty thresholds and used them for statistical purposes. For 2006, the threshold for a four-person family was $20,615 (U.S. Department of Health and Human Services [HHS], 2006). In 2005, 43.1% of the population in poverty (15.9 million people) earned an income below one half of the poverty threshold, while 16.8% of the population in poverty had an income below 125% of the poverty threshold (DeNavas-Walt, Proctor, & Lee, 2006). This study used 2003 poverty thresholds as a basis for identifying students as low socioeconomic status. For 2003, a four-person family earning $18,400 or less a year was considered in poverty (HHS, 2003).

The poverty guidelines have allowed people to qualify for certain federal programs, such as Head Start, the Food Stamp program, the National School Lunch Program (NSLP), and Children's Health Insurance Program. In 2006, the National Poverty Guidelines required the annual income for a family of four to be no more than $20,000 annually, or $9.61 hourly (HHS, 2006). For a family of three, the poverty-level income could not exceed $16,600 and for a family of two, $13,200 (Douglas-Hall, Chau, & Koball, 2006). In order to meet basic needs, families needed a minimum income equal to about 2 times the federal poverty levels (Douglas-Hall, Chau, & Koball, 2006).

For this study, the poverty guidelines identified students for discounted lunch prices as part of the National School Lunch Program (NSLP). The NSLP, a federally assisted program, provides a meal program for children in schools (Rosso & Weill, 2004). Public or nonprofit private schools and residential child-care institutions participate in the school lunch program. The NSLP has operated in nearly 100,000 public and nonprofit private schools and residential child-care institutions and served more than 28 million children each day (U.S. Department of Agriculture [USDA], n.d.). Participating organizations received cash subsidies and donated commodities from the U.S. Department of Agriculture for each meal served. The participating organizations followed the requirements, which included offering free or reduced-price lunches to eligible children. Dietary guidelines must also be followed (USDA, n.d.). Along with lunch, the government offers a school breakfast program and a summer nutrition program. In 2002-2003, the school breakfast program nationwide served approximately 8.2 million children. In July 2002, 83,309 students participated in the summer nutrition program (USDA, n.d.).

Students qualified for free or reduced-price lunches based on their family income. Free lunch prices were available to children whose families have an income less than 130% of the poverty level. For the 2002-2003 school year, a four-person household earned $18,400 or below annually to qualify for free-lunch (HHS, 2003). The 2002-2003 school year was used because it was the first year of the study, and students were more likely to apply for lunch discounts at a younger age. Reduced-price lunches were available to children whose families earned an income between 130% and 185% of the poverty level. In 2002-2003, four-person households whose salary fell between $23,920 and $34,040 were eligible for reduced-price lunches. More recently, in 2006-2007, a four-person household grossing $26,000 or less per year qualified for free lunch. Also in the 2006-2007 school year, a four-person household who earned between $26,000 and $37,000 annually qualified for reduced-price lunches. Families who have earned more than $37,000 did not qualify for any lunch discounts (USDA, n.d.). The guidelines were based on the minimum amount required to meet the basic material needs to live (Carmichael, 2005). In Texas, any child qualifying for free or reduced-price lunch is considered an economically disadvantaged student. Texas does not include any other measure, such as parent's educational attainment or child's birth weight (Singham, 2005).

In 2002-2003, approximately 16 million children consumed free or reduced-price lunches every day (Rosso & Weill, 2004). However, many eligible students did not apply for the lunch discounts because they were embarrassed or too proud to apply (especially in secondary schools) or did not eat the school lunch due to preference or religion. The Inspector General for the U.S. Department of Agriculture investigated this issue in July 2003. Phyllis Fong (2003), U.S. Inspector General, found that 27% more families were certified for free or reduced-price meals than the 2000 Census suggested as eligible. On the other hand, some who did get lunch discounts might not actually be eligible because their parents self-report their income and might have falsely represented their income (Rothstein, 2001). Another concern has been that some schools do not promote the discounts available. Children who qualified for free or reduced-price lunches might not have known the NSLP was available to them. However, even with these possible issues, the NSLP participation data had about the same accuracy as the Census data (Appel & McCallum, 2002).

Of 17 developed nations in the world, the United States ranked at the top of the 2000 Luxembourg Income Study of child poverty, with 22% of the country's children in poverty (Carmichael, 2005). The Luxembourg Income Study contained data from advanced, industrialized countries and was compiled by credible researchers (Biddle, 2001). The child poverty rate in the U.S. nearly doubled the rate of Germany, France, and other wealthy industrialized nations (Carmichael, 2005). The average low-income child in any of the other industrialized nations was at least one third better off than the low-income child in the United States (Biddle, 2001).

The 2005 U.S. Census data reported approximately 14 million children living in poverty (DeNavas-Walt et al., 2006). Children comprised about 35% of the population in poverty (DeNavas-Walt et al.). In 2005, more children under 18 years of age lived in poverty (17.6%) than adults ages 18-64 (11.1%) or adults over 65 (10.1%) (DeNavas-Walt et al.). Even more surprising were the numbers for children under 6 years of age. Approximately 5 million, or 20% of the population in poverty, were children under 6 years of age (DeNavas-Walt et al.).

The Luxembourg Income Study (2000) showed that 49.3% of children with single mothers lived in poverty. In 1990, single parents headed 23% of all families in the U.S. (Carmichael, 2005). Nearly half (48%) of the children in the poorest fifth of the nation were being raised by a single mother, compared to 10% of the children in the richest fifth (Hodgkinson, 2003). Children from a single-parent household tended to have more difficulty academically and struggled to have a secure economic environment (Carmichael, 2005). From the Program for International Student Assessment (PISA) data, 15-year-olds who resided in a two-parent household achieved higher mathematics literacy than those who resided in a single-parent family, but the differences were mostly related to economic factors (Hampden-Thompson & Johnston, 2006). The PISA data measured 15-year-olds' capabilities in reading and mathematics every 3 years for

20 countries belonging to the World Bank high-income group (Hampden-Thompson & Johnston, 2006).

In 2004, almost 18% (or 14 million) of the children in the United States lived in poverty, and approximately 42% were low income. A low-income family was able to meet their most basic needs whereas a family in poverty could not (Douglas-Hall, Chau, & Koball, 2006). A low-income family also has an income approximately twice the national poverty level (Douglas-Hall, Chau, & Koball, 2006). Thirty-three percent of adolescents lived in low-income families.

Younger children, however, faced greater risk of living in poverty (Knitzer, 2007). In 2000, 12.1 million children dwelt in poverty. But within the last few years, another 1.4 million were added to this count (Douglas-Hall & Koball, 2006). Douglas-Hall & Koball (2006) stated that most of the 14 million children in poverty were White since the United States has more White children. However, the low-SES White children accounted for only 16% of the total White children subpopulation. Of all the African-American and Hispanic children, 37% lived in poverty (Hodgkinson, 2002).

In the South, 45% of children under age 6 lived in low-income families (Douglas-Hall, Chau, & Koball, 2006). Between 2000 and 2004, a nine-percent increase occurred in the number of children living in poor families in the South due to the increase in immigrants with low education levels or limited English proficiency and immigrants living in poverty (Douglas-Hall & Koball, 2006). As part of the South, the Texas poverty rate surpassed the national average. In Texas, 16.7% of its population subsisted below the poverty level in 2003-2004. Only three states had more people in poverty (State of Student Aid and Higher Education in Texas, 2006). In 2004, 23.2% of Texas children lived in poverty, compared to 17.8% in the United States (State of Student Aid and Higher Education in Texas, 2006). Of all the children in low-income households, 1 in 10 dwelled in extreme poverty, a 10% increase from 2000 (Center for Public Policy Priorities, 2006).

Thirty percent of urban-school students lived in poverty. Forty percent of children who lived in an urban area attended a school with more than 40% of the students eligible for free or reduced-price lunches. In comparison, only 25% of students in rural areas and 10% of students in suburban areas attended schools with high-poverty levels (Vail, 2003). Clearly, urban areas include more students in poverty.

Pellino (2006) stated that low-SES children lived in environments with circumstances over which they had little control. They did not choose where they live. They did not choose for their parents to be unemployed or disabled. They did not choose to be born into poverty. Even if they wished to escape this environment and do better; they did not have control over the nature and quality of their lives. Though educators have always hoped for success for all of their students, achievement gaps have been found among some large categories of students, specifically low-SES children.

This study considered children to be economically disadvantaged if they received free or reduced-price lunches. Each study summarized below used various terminology for poor students. For the purposes of this study, terms such as poverty, poor, low-SES, and economically disadvantaged, all had the same meaning. Studies with distinction between students receiving free or reduced-price lunches were noted. The next section reviews the achievement gaps and delineates important research conducted on the subgroups categorized by socioeconomic levels.

Achievement Gaps

The achievement gap was defined as the difference in academic performance on tests among groups of students (Shannon & Bylsma, 2002). The Educational Research Service (2001) identified two categories of factors that caused achievement gaps: factors related to the student's socioeconomic status and factors related to the student's school. Inadequate health care, mobility, lack of educational resources in the home, low educational attainment of parents, and unstable family structure as well as attendance in high-poverty schools with low expectations for students, unqualified teachers, and lack of tutoring or enrichment limited the learning of children in poverty (Educational Research Service, 2001).

Achievement in Early Childhood before Elementary School

Family SES in early childhood was found to be far more important in shaping ability and achievement than later in childhood (Duncan & Brooks-Gunn, 2001). Lee and Burkham (2002) determined that children in poverty started school behind their peers from middle-class or wealthier families due to differences in background and experiences. Low-SES children were often born to mothers who have very little prenatal care, which, in turn, led to greater likelihood for children with mental disabilities (Bracey, 2004), infant mortality, or low birth weight (Seccombe, 2007). Women in poverty commonly gave birth to infants with low birth weights, about 5.5 pounds or less (Seccombe, 2007). Low birth weight put an infant at risk for impaired development, including delayed motor or social development. Children born with low birth weight faced greater risk of failing or repeating grade levels (Barton, 2003) and were 50% more likely to score below average in reading and mathematics assessments (Seccombe, 2007).

The home environment and time period prior to elementary school has a strong influence on the achievement of a child. Mathis (2005) believes, “The six hours of instruction a day for 180 days a year cannot overcome the effects of a deprived and impoverished home environment for 18 hours a day 365 days a year” (p. 592). The home itself might have factors that caused a child to struggle academically. According to Seccombe (2007), low-SES children (below 200% of poverty) were 5 times more likely to have high lead blood levels than higher income children. About 16% of low-SES children, compared to 4% of all other children, lived in older housing, which still contained lead paint and caused lead poisoning. Lead exposure, even in small doses, causes learning disabilities, developmental delays, behavioral problems, and other health issues (Seccombe, 2007).

In 2002, 34.9 million people dwelled in households experiencing hunger or food insecurity (Rosso & Weill, 2004). In 2003, 18% of the population included children living in food insecure households (Federal Interagency Forum on Child and Family Statistics, 2005). The U.S. Department of Agriculture identified food insecurity with an 18-item measure. A family experiencing three or more of the items was considered food insecure. Food insecurity was rated on a scale of food secure, food insecure without hunger, food insecure with moderate hunger (an adult went hungry but the child did not), and food insecure with severe hunger (at least one child went hungry) (Dunifon & Kowaleski-Jones, 2001). Food insecurity caused children to be in a weakened state.

Hungry or malnourished children were more likely to have frequent colds, missed days of school, impaired brain function, and grade level retention, all of which may lead to lowered academic achievement (Seccombe, 2007). Kindergarteners from food insecure homes scored lower than other students on mathematics tests administered at the start of the school year. Likewise, they learned less over the school year (Seccombe, 2007). Poor students who received a free breakfast gained about 3 percentile points on tests compared to poor students who were eligible but did not participate in the program (Barton, 2003). Good meals each day made a difference.

Children from poverty are unprepared for school. They often lack readiness to learn, physical strength, and mental mindset (Pellino, 2006). In 2005, a family member read to 60% of children ages 3 to 5 daily. However, children living in families below the poverty thresholds were less likely to be read to daily than their peers in high-SES households. A lack of reading exposure lowered reading readiness and resulted in delayed reading abilities for low-SES children (Federal Interagency Forum on Child and Family Statistics, 2006; Coley, 2002). Literacy development, knowledge of the alphabet and print, and characteristics of written language remained foreign to children who seldom looked at books (Barton, 2003). Likewise, children in poverty had slower language acquisition, literacy development, achievement in reading comprehension, and success in academics (Barton, 2003). Students from low SES consistently demonstrated difficulty in development of their receptive language, which led to difficulties with reading and, thus, low academic achievement (Parrish, 2004).

Children raised by parents who hold professional jobs grow up to be more inquisitive and active in their learning when compared to children of parents in the working class. By age 3, children from low-SES families demonstrated a significantly lower vocabulary than children from middle- and high-SES families (Shannon & Bylsma, 2002). Professional parents spoke more than 2,000 words per hour to their children, while working-class parents spoke about 1,300 words; mothers on welfare spoke 600 words. The vocabulary of 4-year-olds from professional families was almost 50% larger than those of working-class families and twice as large as those of welfare families. A lower vocabulary leads to slower language development (Rothstein, 2004). Differences in verbal test scores at ages 2, 3, and 5 showed that family income affected intelligence. About a third of a standard deviation was found between the groups of children in poverty and children not in poverty (Duncan & Brooks-Gunn, 1999).

In families whose income fell below the poverty level, children under 5 years old scored 0.30 standard deviations from the gap in achievement between poor and non-poor children (Duncan & Magnuson, 2005). The differences in achievement for the study were not due to differences in mothers' education, children's birth weight, or family structure but to family income (Duncan & Magnuson, 2005). Children from families with a higher income experienced a more stimulating learning environment, including better access to books, newspapers, and learning opportunities (Duncan & Magnuson, 2005). With the additional exposure to literature and activities, children were better prepared for school and more familiar with language and literacy. Likewise, warm, responsive, and involved parents provided a better household climate for higher achievement. Parents were more inclined to be more warm and responsive if they did not have economic hardship, income loss, or unemployment (Hanson, McLanahan, & Thomson, 1999).

Five-year-old children living in poverty over a 4 year span scored an average of nine intelligence quotient (IQ) points lower than students who were never poor. Five-year-olds who lived in poverty for some of the 4 years scored five IQ points lower than those who were never poor. Participants were part of the Infant Health and Development Project (Smith, Brooks-Gunn, & Klebanov, 1999). Similarly, children 4 years of age who have lived below the poverty line were 18 months below average for their age group. This gap continued and then leveled out when the children reached 10 years of age (Klein & Knitzer, 2007). Differences in IQ have a statistically significant effect on achievement of children.

Early Childhood Programs and Head Start

Early childhood programs have proved critical to the future learning of young children, especially those in poverty. In 2005, 16% percent of low-income families placed their children in center-based care and 10% percent with other relatives. In contrast, 25% of families at or above the poverty line placed their children in center-based care, and 6% asked relatives to watch their children (Federal Interagency Forum on Child and Family Statistics, 2005). The majority of preschool-aged children stayed at home during the day with one of their parents.

For students who received reduced-price lunches in 2003, having attended prekindergarten increased their language scores by 35% (Gormley & Phillips, 2003). The greatest effect showed in students eligible for free lunches and who attended prekindergarten. These students increased 31% in cognitive skills, 18% in language abilities, and 15% in motor skills (Gormley & Phillips, 2003). Prekindergarten programs caused little effect on students who did not qualify for any lunch services (Gormley & Phillips, 2003).

In 2006, only 17% of 4-year-olds attended state-funded prekindergarten programs. Four-year-old children were behind if they did not participate in prekindergarten (Knitzer, 2007). Very few programs have been designed to raise the achievement levels of children in poverty. However, Head Start has been one program that focuses on this subpopulation. Head Start, established in 1965, has been the United States's largest federally funded preschool program (Krueger, 2003). A recent study (Books, 2004) showed a minimal 60% of the eligible children attended Head Start. Eligibility for Head Start requires a family income at or below poverty level. Head Start attempts to educate not just students but families as well. The four major components to the Head Start program assist the whole family- health, education, parental involvement, and social services (Hodgkinson, 2003).

In 1995, Early Head Start was established for children from ages 0 to 3 years old. As an extension of Head Start, Early Head Start increased the cognitive, language, and social-emotional development of children when compared to their non-participating peers (Krueger, 2003). The Bayley Mental Development Index and MacArthur Communicative Development Index identified effect sizes of 0.10 to 0.15 standard deviations (Krueger, 2003). The Bayley Mental Development Index assesses sensory perceptual acuities, early acquisition of object permanence and memory, learning and problem-solving ability, verbalizations, and early evidence of the ability to form generalizations. The MacArthur Communicative Development Index serves as a vocabulary checklist which indexed language production (Krueger, 2003). Head Start programs have benefited many children.

Fortunately, children in Texas are given many opportunities to attend Head Start. In 2005, 15% of 3-year-olds attended Head Start; hence, Texas ranked 21 out of 50 states in participation. Amazingly, 58% of 4-year-olds attended Head Start, putting Texas at 5 out of 50 states (Rocha & Sharkey, 2005).

The longitudinal effects of Delaware Early Childhood Interventions on achievement were examined. Findings proved that getting a jumpstart on education helped significantly. Students who attended Head Start or Early Childhood Assistance Programs (ECAP) were more likely to have performed at or above the standard on their third-grade reading and mathematics state tests than their peers who also lived in poverty but did not receive this education (Gamel-McCormick & Amsden, 2002). ECAP was modeled after Head Start and uses Head Start materials and curriculum. Preschool students were tracked until they reached third grade and were then administered the Delaware Student Testing Program exams. Looking only at the children who were in poverty in kindergarten, 69% of those who obtained early intervention services at age 4 met or exceeded the standard on the state reading test and 62% did the same on the mathematics test. In comparison, only 48.7% of the students who did not receive interventions met or exceeded the reading standard and 45.8% the mathematics standard (Gamel-McCormick & Amsden, 2002). Still, students in poverty scored less than the statewide average. Overall, 75.1% of Delaware students met or exceeded the standard in reading and 73.4% in mathematics (Gamel-McCormick & Amsden, 2002).

Head Start evaluations demonstrated immediate gains on test scores, but after children entered elementary school (first grade), no educationally significant differences on any of the measures were found. Likewise, no differences in reading performance were discovered after third grade between students who attended Head Start and those who did not (Clark, 2002). A family's economic welfare during early and middle childhood had more consequences than during adolescence in molding a child's ability and achievement (Duncan & Brooks-Gunn, 2001).

Achievement in Elementary School

Rothstein (2004) stated that raising achievement of low-SES children through school reform would not suffice. An improvement in the low-SES child's social and economic conditions must be made (Rothstein, 2004). Social class differences in academic achievement were set at 3 years of age, and the gap continued to increase when there was a lack of summer programs and after-school activities (Rothstein, 2004). Children from middle and higher SES had an advantage because their parents could afford extracurricular activities, which gave their children self-confidence and allowed exposure to the world outside of their homes and communities. Children developed inquisitiveness, creativity, self-discipline, and organizational skills from programs such as athletics, dance, drama, museum visits, recreational reading, and other educational activities (Rothstein, 2004).

Throughout kindergarten, the achievement gap widened (Borman, 2002). Differences in a low-SES first grader were clearly observed in the classroom. Teachers described low-SES students as more likely to be inattentive to the instruction, unable to sit still, and unable to complete their own work (McCargar, 2004). Middle- or high-SES kindergarten and first-grade children were more successful in reading skills than low-SES children. In kindergarten, the largest gap existed in the area of sight words. Three percent of entering kindergarteners who were not poor recognized a set of words by sight as compared to less than 0.5% of poor children (Denton & West, 2002). At the end of first grade, the gap narrowed somewhat between non-poor (86%) and poor children's (67%) ability to read sight words. Also, 2 times as many first-grade students from families above poverty than from poor families understood words in context, 52% compared to 27% (Denton & West, 2002). For mathematics, a gap existed between poor and non-poor first-grade students in performing multiplication and division. Almost 3 times the percent of children who were above poverty (30%) could complete multiplication and division problems as compared to poor first-grade students at 11% (Denton & West, 2002). Thus, differences in reading and mathematics achievement started before kindergarten and continued into first grade.

Many state assessments target fourth grade as a benchmark year. Fourth-grade students in the Stamford Connecticut Public Schools showed differences in achievement among SES groups. The mean score on the 2000-2001 Connecticut Mastery Test Program exam for reading was 198 for students receiving free lunches, 235 for students receiving reduced-price lunches, and 245 for students receiving no lunch discounts. Thus, students receiving free lunches achieved lower than those receiving reduced-price lunches, and both free and reduced-price lunches students scored lower than students who were not economically disadvantaged (Paris, 2003). Paris's study only included 121 participants from the same school district. The sample size was quite small.

Approximately 9,000 fourth-grade students in North Carolina were administered the North Carolina Assessment Program exam in reading and mathematics. Students who received free lunches were compared to students who were not economically disadvantaged. Students who received reduced-price lunches, as well as students who were from Asian, Hispanic, or American Indian ethnicities, were not included in the study. For reading achievement, students who were not economically disadvantaged scored higher than those who had free lunches. The analysis of variance (ANOVA) revealed a statistically significant difference between the two lunch groups (F-2227.69, $p<0.001$) (Higgins, 2006). Lunch status accounted for approximately 22% of the variability in reading achievement between the groups (Higgins, 2006). In terms of mathematics achievement, again the scores for the not economically disadvantaged students exceeded the free-lunch students. The ANOVA showed statistically significant results with $F=2443.03$, $p<0.001$. SES accounted for 23% of the variability in the scores between the two groups (Higgins, 2006).

Researchers (Mulvenon et al., 2001) examined the 1999 Fourth Grade Benchmark Exam scores from more than 30,000 students in Arkansas. The result showed the percentage of students receiving free and reduced-price lunches was a predictor of performance on the criterion-referenced exam (Mulvenon et al., 2001). A 22-point gap in mathematics and a 38-point gap in reading on standardized test scores existed between students receiving free or reduced-price lunches and their not economically disadvantaged peers. The effect sizes for literacy and mathematics were greatest when comparing the students from the top and bottom deciles of SES. (A decile is 10% of the population.) Students within the 10-19 decile compared to the 70-79 decile had an effect size for literacy of 1.39 and for mathematics of 1.78 (Mulvenon et al.). Mulvenon et al. observed greater effect sizes when comparing the 10-19 decile to the 90-99 decile students. The literacy effect size was 2.53 and mathematics was 3.27 (Mulvenon et al.). Any effect size of 0.5 or higher was considered meaningful or significant. The effect sizes in the study clearly proved SES affected achievement.

Carmichael (2005) studied economically disadvantaged and economically advantaged students in fourth and sixth grades in White County, Tennessee, for the 2003-2004 school year. Economically disadvantaged was defined as receiving free or reduced-price lunch. Using archival data from the Tennessee Comprehensive Assessment Program (TCAP) and Terra Nova (published by CT/McGraw Hill), Carmichael (2005) measured student achievement. Approximately 300 students were included in this study per grade level and about half were economically disadvantaged. Students in fourth grade showed no significant differences in achievement of mathematics, proficiency in mathematics and proficiency in reading. However, a significant difference in achievement for economically disadvantaged sixth-grade students in reading and mathematics scores and reading and mathematics proficiency levels was found. Differences in achievement widened as children advanced to higher grades. Also, the consequences of poverty had a greater impact the longer a child lived in those conditions (Carmichael, 2005).

In 1999, 58% of low-income fourth-grade students in the United States could not read. Similarly, 68% of low-income inner-city eighth-grade students could not meet the basic mathematics standards for their grade level (Carter, 1999). Analysis of fourth- and eighth-grade Iowa Test of Basic Skills (ITBS) results in 1996-97 showed students with low SES scored poorly on that test. The strongest factor affecting the ITBS scores was parent education level, followed by the eligibility for free or reduced-price meals (Shannon & Bylsma, 2002).

The National Assessment of Education Progress (NAEP), or the Nation's Report Card, has been the only nationally representative and continuing assessment on a sample of America's students in reading, mathematics, and a variety of other subjects. The NAEP scores proved to be the most consistent data about achievement gaps (Kober, 2001). The NAEP data were unavailable for specific schools or individual students, but the assessment did give data on subject matter achievement, on certain populations of students, and for subgroups of assessed students such as gender and ethnicity (Grissmer, Flanagan, Kawata, & Williamson, 2000). NAEP scores are reported as scale scores and by the following achievement levels: Basic, Proficient, or Advanced. Scale scores range from a 0-500 scale. For reading, Basic means the students demonstrated an understanding of the overall meaning of what they read (National Center for Education Statistics [NCES], 2006a). The actual scale score to begin the Basic level is 208. To be considered Proficient, the step above Basic, the student must have scored at least 238. At a Proficient level, students demonstrate an overall understanding of the text, literally and inferentially. They extend their ideas by making inferences, drawing conclusions, and making connections to their own experiences (NCES, 2006a). Last, Advanced means students perform at a superior level of 268 or better. Students who are Advanced demonstrate an awareness of how authors compose and use literary devices. They judge critically and give thorough answers that display careful thought (NCES, 2006a). Scores from the 2003 reading NAEP showed, nationally, 15% of low-income children ranked Proficient compared to 41% of non-poverty children at Proficient (Rocha & Sharkey, 2005). Specifically for Texas, 16% of low-SES children fell in the Proficient level in reading as compared to 39% of middle- or high-SES children (Rocha & Sharkey, 2005). With these results, Texas fourth-grade students ranked 38 out of 50 states in reading and 24 out of 50 in mathematics (Rocha & Sharkey, 2005).

A family's socioeconomic status strongly predicted student achievement on the Washington State Assessment of Student Learning (WASL) and the Iowa Test of Basic Skills (ITBS) (Shannon & Bylsma, 2002). Low socioeconomic status made up 12% to 29% of the variance in academic achievement whereas ethnicity was only 0.6%. Hence, while many students from minority backgrounds were also low-SES, the SES seemed to play a bigger part in a student's academic success (Shannon & Bylsma, 2002).

In 1999, Great City Schools, which included 61 districts of the nation's large city schools, analyzed test results to show the condition of education across the nation. Of the students who attended Great City Schools, 62.9% were eligible for free lunches (Casserly, 2004). Data from the Great City Schools indicated that districts with higher poverty levels had lower student achievement. In reading comprehension for fourth grade, students in moderate- and high-poverty schools were 18.2 points below students attending schools at average economic levels. For mathematics, fourth-grade students in low-SES schools scored 15.7 points lower than students attending schools at average economic levels (Eisner, 2001).

The same results were found when using data from the Children of the National Longitudinal Survey of Youth (NLSY). However, in this study, poverty was associated with mathematics and reading indirectly. Instead, the lack of stimulating and supportive home life was linked to achievement. A greater effect was found in reading achievement than in mathematics achievement (Eamon, 2002).

Looking specifically at language and reading, Canadian students' literacy achievement scores were separated into four SES quartiles. SES was based on the household income. The results from a gradient analysis in 2003 showed that starting in kindergarten, word-reading achievement was related to SES. For students with English as their first language, the analysis showed that word-reading scores increased with SES. After examination of the scores over time from English Language Learners, the same relationship was found; as SES increased, word- reading achievement increased as well (D'Angiulli, Siegel, & Maggi, 2004).

Focusing solely on mathematics, Mosley (2006) studied the differences in achievement of students receiving free or reduced-price lunches and those paying full price as measured by grades in school and scores on the SAT-10. A significant relationship was found. Students with low SES had low grades in class and lower SAT-10 mathematics scores (Mosley, 2006). However, low mathematics scores were possibly due to a lowered reading ability.

Higgins (2006) found a correlation coefficient of 0.732 between mathematics and reading achievement in students who paid full price for lunch (Higgins, 2006). Students who received free lunches had a correlation coefficient of 0.688 between reading and mathematics achievement. Students missed mathematics word problems because of limited reading skills, not because they lacked understanding or computational skills (Higgins, 2006). Statistically significant differences between fourth-grade students receiving free lunches and those paying full price for lunches were found in reading and mathematics achievement (Higgins, 2006). According to Higgins (2006), reading achievement was the key to the differences in mathematics achievement.

Duncan and Brooks-Gunn (2001) found family income significantly affected children's ability and achievement measures. Over a 20-year period, Jimerson, Egeland, and Teo (1999) conducted a study on the academic achievement of 174 children who were part of the University of Minnesota Mother-Child Project. The study (Jimerson et al., 1999) revealed the SES level of students in Grades 1 through 3 greatly affected the Grade 6 mathematics achievement, and SES in Grades 1 through 6 significantly affected achievement for 16-year-olds. Also, lower SES showed downward deflections in mathematics achievement and, conversely, higher SES showed upward deflections in achievement (Jimerson et al.).

The home environment and family financial status significantly affected children's achievement. Resource differences in a family accounted for about half of a standard deviation (or 8 out of a 15-point standard deviation) (Duncan & Magnuson, 2005). A child might be unsuccessful in school because of the conditions frequent in poverty, such as a single parent family, parents' age, or parents' education level (Brooks-Gunn, Duncan, & Maritato, 1999). Likewise, low achievement in school might be due to the financial factors associated with poverty, such as lack of food, housing, books, or educational toys (Brooks-Gunn et al.). Table 1 displays a summary of the research on achievement gaps.

Table 1

Summary of Select Studies of Academic Achievement Gaps

Study	Sample	Measurement	Results
Denton & West, 2002	Kindergarten Students	Recognized a set of words by sight	3% not economically disadvantaged (ED) and <0.5% of poor students recognized a set of words by sight
Denton & West, 2002	First-Grade Students	Literacy	86% not ED and 67% poor read sight words. 52% not ED and 27% poor understood words in context.
Denton & West, 2002	First-Grade Students	Multiplication and division problems	30% not ED and 11% poor could complete multiplication and division problems
Paris, 2003	Fourth-Grade Students	Connecticut Mastery Test Program	198 for free lunch, 235 for reduced-price lunch, 245 for not ED
Higgins, 2006	Fourth-Grade Students	North Carolina Assessment Program Exam for reading and mathematics	Statistical significance between students receiving free lunches and no lunch discounts in mathematics and reading. For reading and mathematics, SES accounted for about 22% of the variability.

(table continues)

Table I *(continued)*

Study	Sample	Measurement	Results
Mulvenon, Ganley & Fitts-Scott, 2001	Fourth-Grade Students	Fourth Grade Benchmark Exam (Arkansas)	Largest difference between students in the top 10% and bottom 10% of the population ranked by SES. Effect sizes were 2.53 for reading and 3.27 for mathematics.
Rocha & Sharkey, 2005	Fourth-Grade Students	NAEP	15% of low-income ranked Proficient, 41% of not ED students ranked Proficient
Eisner, 2001	Fourth-Grade Students	Reading comprehension and mathematics	In reading comprehension, students in moderate and high-poverty schools were 18.2 points below students attending schools with average economic levels. For mathematics, students in moderate and high-poverty schools were 15.7 points below students attending schools with average economic levels.
US Department of Education, 2001	Third- and Fifth-Grade Students	SAT-9 for Reading and Mathematics	Third-grade students from lowest SES schools scored 596.8 in reading and 591.3 in mathematics. (National norms were 614 in reading and 600 in mathematics.) Fifth-grade students from lowest SES schools scored 635.12 in reading and 637 in mathematics. (National norms were 654 in reading and 646 in mathematics.)

Unfortunately, intelligent and talented low-SES students have no control over their family's income. Even though public school is free, a family must still afford school clothes and basic school supplies. Thus, a poor student who cannot afford the essentials drop out of school due to their family's financial situation, and, often, talented low-income children do not complete high school, get a diploma, or enter college. Ultimately, they are viewed as unsuccessful and low achieving (Schiller, 2004). Thus, the poor are not academically unsuccessful because of their lack of capabilities, but rather their family's financial status does not permit them to continue their education (Schiller, 2004).

Outside of school, the opportunities for a student who lives in poverty do not compare to those of more affluent peers. Unfortunately, low-SES children cannot afford extracurricular activities or summer school programs. Without the continuous mental stimulation, a child in poverty cannot sustain achievement gains throughout the summer and lag further behind the high-SES child academically (Borman, 2002). The achievement gap starts small but then grows to be quite wide. Achievement gaps emerge and evolve from kindergarten to high school.

Title I in Schools

Title I has been the largest single educational funding source from the federal government (North Carolina Public Schools, n.d.). Title I started with the passage of the Elementary and Secondary Education Act of 1965 to increase academic achievement and help all children reach grade level proficiency by providing additional resources, such as more teachers to reduce class size, teaching assistants, tutoring, computer labs, parental education and involvement opportunities, prekindergarten programs, professional development, and materials or supplies (North Carolina Public Schools, n.d.). Title I money was designated to help children who were behind academically or at risk of failing a grade level. Federal funding for school districts through Title I was the same for children whether or not they were eligible for free or reduced-price lunches. Since the start of Title I, more than 15 million children have been served and $13 billion in federal money spent on students in high-poverty schools (U.S. Department of Education [USDOE], 2004).

The federal government provided the TEA a certain amount of money for Title I grants based on the number of low-SES students as defined by the federal poverty guidelines on the latest census. The federal guidelines for poverty have been dependent on two items: the number of children that depend on the head of household's support and the overall household income (USDOE, n.d.b). The Federal Poverty Guidelines are calculated based on the food cost for each family size; nothing else is taken into consideration, not housing, cost of living, child care costs, nor health care costs (Center for Public Policy Priorities, 2006).

Districts allocated the majority of the funding to elementary schools; three fourths of the Title I schools served children from prekindergarten to sixth grade (USDOE, 2006). Almost 90% of participants were in kindergarten through eighth grade (Borman & D'Agostino, 1996). The greatest improvements in achievement have been shown in the lower grade levels because more students participated (Borman & D'Agostino, 1996).

The Longitudinal Evaluation of School Change and Performance (LESCP) study examined student achievement in 71 Title I schools with high-poverty students. The majority of the schools in the LESCP study had between 75% and 90% of their students in poverty. Students in third and fifth grades took the SAT-9 in reading and mathematics. Third-grade students eligible for free or reduced-price lunches scored 602.5 in reading while the national norm was 614. Third-grade students from the lowest schools, with 100% of the students in poverty, scored only 596.8 in reading. For mathematics, the low-SES students scored 591.3 in third grade compared to the national norm of 600. Lower yet were third-grade students attending the highest poverty schools, scoring 588.2. In both reading and mathematics, low-SES students scored below the national norm. If the students attended a high poverty school with 100% of students in poverty, then the students scored another 5 points lower (USDOE, 2001).

Fifth-grade students eligible for free or reduced-price lunches (low SES) had reading scores of 640.8, and those in schools with 100% of the student body in poverty scored 635.12, compared to the national norm of 654 (USDOE, 2001). For fifth-grade students of low SES, mathematics scores averaged 637. Fifth-grade students attending schools with all the students in poverty scored 640.2.The fifth-grade national norm was 646 (USDOE, 2001). The LESCP data also showed several gaps in achievement and growth among third-grade students. Students who participated in Title I lagged behind their peers approximately 14-and-a-half months in reading and mathematics (Wong et al., n.d.). Students who partook free or reduced-price lunches were 9.7 months behind average third-grade students in reading and 8.1 months behind in mathematics (Wong et al.).

In the past, some low-SES students have not been served. Because funding for Title I is distributed based on the districts' overall numbers of economically disadvantaged children, individual schools with significant needs are overlooked (Fagan

& Kober, 2004). Districts then redistribute the funding based on schools with the most needs. Schools with few low-SES children do not receive Title I funds. Therefore, many low-SES children are not attending schools with the additional teaching assistants, reduced class sizes, and small group remediation (Thompson & O'Quinn, 2001).

Also, some families do not apply for the free or reduced-price lunch rates due to pride and unwillingness to show need. This situation is more frequent in the secondary schools where older students do not want other students to know their SES. Thus, in some schools, students who should be receiving free or reduced-price lunches are not recorded as needing it (Rothstein, 2001).

Some schools do not direct the extra money that they are given to the low-income students. Children who are included in Title I services have failed or are at-risk of failing state assessments. Children who are wealthy but low achieving participate in Title I, and, vice versa, a successful low-SES child does not receive Title I services (North Carolina Public Schools, n.d.). In this case, wealthy students partook in Title I services that should have been allocated to low-SES students, and low-SES students did not receive Title I services because they passed the state assessment (Rothstein, 2001). Also, schools with more than 40% of their students designated as low-income often provided a schoolwide Title I program, which served all students in the school (USDOE, n.d.a). Thus, not all students receiving free and reduced-price lunches needed Title I services (Rothstein, 2001).

Data from the Sustaining Effects Study showed compensatory education was generally effective in accelerating growth of reading and mathematics achievement and narrowing the gap between those of high and low SES. But compensatory education was not enough to close the gap and equalize the achievement levels of children from different SES levels (Borman, Stringfield, & Slavin, 2001). Compensatory education, defined as additional intensive and accelerated instructional services, included Title I. The Sustained Effects Study also concluded that students in Title I made greater gains in the earlier grades than the upper grades. The greater gains in the earlier grades were most likely due to the allocation of funding. Most districts allocated funding for Title I to Grades kindergarten to 8 rather than 9 to 12 (Borman, Stringfield, & Slavin, 2001).

Title I benefits children who are at risk and in poverty. Higher achievement was seen in reading as compared to mathematics, but this might be due to the additional funds dedicated to reading versus mathematics. Also, more students participated in Title I for reading than for mathematics. If Title I and other remediation programs did not exist, then an increase in achievement and a narrowing of the gap would not be seen (Borman & D’Agostino, 1996).

Texas Assessment and Achievement

The State of Texas has required assessments in reading, mathematics, and writing since 1980. In 1980, Texas began assessment with the Texas Assessment of Basic Skills (TABS), and in 1985 moved to the Texas Educational Assessment of Minimal Skills (TEAMS). A shift occurred in 1990 by assessing academic skills rather than minimum skills. Thus, the Texas Assessment of Academic Skills (TAAS) was designed (TEA, n.d.a). In the 1998-1999 school year, Texas introduced a revised state curriculum, TEKS. The previous curriculum was based on the Bloom’s Taxonomy lower levels of thinking such as knowledge and comprehension. The TEKS, however, includes the more complex thinking skills, including application and analysis, and challenges students with problem solving. In 2002, the TAKS was implemented and was more rigorous and comprehensive than the former TAAS test (Sherman & Jones, n.d.). Each TAKS assessment has a portion dedicated to higher order thinking skills. The TAKS reading test has a portion for critical thinking. The TAKS mathematics test has a portion for problem solving and mathematical thinking skills.

In 1996, Governor George W. Bush initiated the Texas Reading Initiative which required school districts to teach all third-grade students to read at or above grade level (TEA, n.d.a). This goal spawned a plethora of reading programs and requirements. Teacher reading academies were developed and provided instruction on how to better teach reading (TEA, n.d.a). The Accelerated Reading Instruction (ARI) Grant Program, the main program to support reading instruction, provided immediate, focused instruction to students from kindergarten through sixth grade that were identified as struggling in reading. (The same program existed for mathematics, Accelerated Math Instruction.) During the 1999-2000 school year, ARI was implemented for only kindergarten students. Each year, additional grade levels were added to the program. During the 2005-2006 school year, 563,559 students in Grades K to 6 were served through the ARI program (Adams, Sievert, & Rapaport, 2007). Results from the ARI program showed that, of the kindergarten to sixth-grade students who were struggling to read at the beginning, 66% were reading on level by the end of the school year (Adams et al., 2007).

The Texas Math Initiative was implemented in the 2003-2004 school year and only included students from kindergarten to fourth grade. In 2004-2005, fifth-grade students were added, and, in 2005-2006, sixth-grade students participated in

Accelerated Math Instruction (AMI). Patterned after the Texas Reading Initiative, the Math Initiative also led to professional development courses for teachers and additional materials to supplement classroom lessons. The Texas Math Initiative was established to ensure that all fifth-grade students were at grade level in mathematics (TEA, n.d.b). Intensive mathematics instruction, AMI, was provided to students who struggled to meet expectations. During the 2005-2006 school year, 474,067 kindergarten through sixth-grade students participated in AMI. Of these 474,067 students, 69% were assessed as on grade level in mathematics at the end of the year (Adams et al., 2007).

The reading interventions began first while the mathematics remediation was added four years later (Adams et al., 2007). Hence, on the TAKS reading test, more students met the standard and received commended performance than on the TAKS mathematics test (see Tables 2 and 3). More economically disadvantaged students met the standard and attained commended performance in reading than in mathematics, as well. However, when compared to all students, a larger percentage of students who were economically disadvantaged did not meet the standard or receive as many commended scores. Meeting the standard was considered passing for the TAKS tests. Commended performance refers to high academic achievement with a thorough understanding of grade-level essential knowledge and skills. Commended performance was designated when scale scores are at or above 2400, which means the student can miss only a couple questions on the test (TEA, 2005a).

Table 2

Statewide Percentages of Met Standard and Commended Performance on the TAKS Reading Test

	2003 3rd Grade		2004 4th Grade		2005 5th Grade		2006 6th Grade	
Group	Met Std.	Comm.	Met Std.	Comm.	Met Std.	Comm.	Met Std.	Comm.
All Students	81	26	81	25	75	23	91	39
Economically Disadvantaged	72	15	73	14	64	12	87	26

(TEA, 2007)

Table 3

Statewide Percentages of Met Standard and Commended Performance on the TAKS Mathematics Test

	2003 3rd Grade		2004 4th Grade		2005 5th Grade		2006 6th Grade	
Group	Met Std.	Comm.	Met Std.	Comm.	Met Std.	Comm.	Met Std.	Comm.
All Students	74	18	78	21	79	30	79	31
Economically Disadvantaged	65	11	70	13	71	20	72	20

(TEA, 2007)

Because of the Texas Reading Initiative and Texas Math Initiative, more students than in the past were successful in reading and mathematics achievement. Approximately 500,000 students participated in ARI and AMI each year, and positive results occurred with two-thirds of the students (Adams et al., 2007).

Depth of Poverty

Whether a child experiences poverty during early or late childhood does not affect academics (Smith et al., 1999), but the depth of poverty has shown differences. Children who were in “deep and persistent poverty” (Duncan & Magnuson, 2005) have the poorest scores and largest gaps in achievement. On assessments, children who were persistently poor, poor over a 4-year period, scored 6 to 9 points lower than wealthier peers (Seccombe, 2007).

If a family below or near poverty has an increase in income, the impact on academic ability and achievement is much greater than that of families from high SES (Duncan & Brooks-Gunn, 2001). For preschool and elementary-school-aged children, when family income was increased roughly $1,000 a year, then achievement increased by approximately 0.07 standard deviations (Duncan & Magnuson, 2005). A 30-point variance in test scores existed for every $10,000 change in household income (Darden, 2003). Just increasing the incomes of low-income families alone could positively affect child development, especially at the younger ages (Knitzer, 2007).

Smith et al. (1999) examined the changes in the income-to-needs ratio from the Children of the National Longitudinal Survey of Youth (NLSY) study. The income-to-needs ratio was calculated by dividing the family’s total income for each year of a child’s life by the U.S. poverty threshold for the child’s family, based on the number of people in the household for each year of the child’s life up to and including the income data for the year of the assessment. Smith et al. used student scores on the Peabody Picture Vocabulary Test-Revised (PPVT-R) or the Peabody Individual Achievement Test (PIAT) to track groups of children: 3- to 4-year-olds, 5- to 6-year-olds, and 7- to 8-year-olds. All tests were normed with means of 100 and standard deviations of 15. The study controlled for family structure, ethnicity, mother's education, child's age, and birth weight. If the average family income increased from 1 point to 2 points on the income-to-needs ratio, then there was a 3.0 to 3.7 point increase in the child's score on the PPVT-R or PIAT (Smith et al.). Results of the study showed an increase in income for a child in poverty had a much greater effect on achievement than for a child in middle-class and wealthy families (Duncan & Brooks-Gunn, 2001).

Continuous poverty had a stronger effect on a child's reading recognition than on mathematics. From age 5 to 6, children in continuous poverty scored 9.2 points lower in reading recognition and 5.7 points lower in mathematics as compared to the average scores on the Peabody Individual Achievement Test (PIAT). For children from age 7 to 8 in continuous poverty, reading recognition scores were 8.47 points lower and for mathematics 6.75 points lower than the average scores on the PIAT. At age 5 to 6, a 4.2 point difference in scores between children living in middle-income groups and children in the near-poor range was found on the PIAT Reading Recognition test, but there was no difference on the PIAT Mathematics test (Smith et al., 1999). The greatest difference surfaced for children age 5 to 6 in continuous poverty in reading.

The Infant Health and Development Program (IHDP) sample for the same groups of students revealed a similar finding. The affluent group of children in the National Longitudinal Survey of Youth sample scored about 4 to 6 points higher than the near-poor group on assessments. Comparing the affluent and the near-poor group in the IHDP sample, the students in the affluent group scored 9 to 10 points higher (Smith et al., 1999).

The relationship between achievement and socioeconomic status could be compared to a socioeconomic ladder, where each step up increased achievement

(Fransoo et al., 2005). In a study by Fransoo et al., students were categorized, based on their family income, into four groups: high, middle, low-middle, and low-SES. Conclusions were not as dramatic when simply reviewing the passing rate, but when looking at the failures, a larger discrepancy was found. Ninety-two percent of the high-SES Grade 12 students passed the 2001-2002 Standards Test in Language Arts as compared to 83% of the middle-SES students, 83% of the low-middle SES students, and only 75% of the low-SES students. Each SES level showed approximately 5% fewer students passing. However, when looking at the failures, 25% of the low-SES students failed while only 8% of the high-SES students failed the exam (Fransoo et al.). The gradient would have been steeper when looking at the students who should have taken the exam but did not because they had already dropped out, been retained in a lower grade level, or withdrawn from the school (Fransoo et al.). Also, this same pattern occurred in third grade (Fransoo et al.).

Lee and Burkam studied children 5 years and under for their academic abilities. The researchers separated the students into SES quintiles (20% increments). Students in the lowest quintile of wealth attained 0.55 standard deviations below the middle quintile of wealth in mathematics and 0.47 standard deviations below in reading (Lee & Burkam, 2002). Children in the lowest SES groups scored 60% lower in mathematics and 56% lower in reading than children in the highest SES groups. High-SES students achieved 0.69 standard deviations higher than middle-SES students in mathematics and 0.70 standard deviations in reading (Lee & Burkam, 2002). Low-SES students scored 0.55 standard deviations below middle-SES students in mathematics and 0.47 standard deviations in reading. The average cognitive scores of preschool children in the top 20% (highest SES) were 60% above the average scores of the children in the bottom 20% SES group (Klein & Knitzer, 2007).

The Progress in Reading Literacy Study (PIRLS) 2001 measured fourth-grade students' reading abilities and took school data from around the world. Schools were divided into quintiles by percent of students receiving free or reduced-price lunches. In the United States, in schools with fewer than 10% of students receiving free or reduced-price lunches, the students attained 589 out of a total 600 points. For schools where 10% to 24.9% of the student body received free or reduced-price lunches, the students scored 567. For schools comprised of 25% to 49.9% low-SES students, the students achieved 551. Schools with 50% to 74.9% of the students economically disadvantaged performed with a score of 519, and, finally, schools with 75% or more of the students receiving free or reduced-price lunches scored 485 (Ogle et al., 2003). Achievement consistently declined as the schools' percentage of low-SES students increased.

Data from the Children of the NLSY and the Infant Health and Development Project (IHDP) presented children in the very poor group with an intelligence quotient (IQ) of 7 to 12 points lower than children in the near-poor group. Very poor in this case was defined as 50% of the poverty level (Smith et al., 1999). (This percentage of the poverty level was significantly less than the 130% to qualify for free lunch. To receive reduced-price lunch, the child must be between 130% and 180% of the poverty level.) Children whose family income ranged from 50% to 100% of the poverty level attained an IQ of 4 to 7 points lower than the near-poor group (Smith et al.).

Extreme poverty leads to homelessness. According to the Stewart B. McKinney Act, a person is considered homeless if they are living in a public or private shelter designed to provide temporary living accommodations, if they are at an institution which provides a temporary residence for individuals intending to be institutionalized, or if they are in a public or private place not meant to be a regular sleeping accommodation for human beings (National Coalition for the Homeless [NCH], 2006). In 2006, approximately 1.35 million children were homeless in the United States, 39% of the homeless population (NCH, 2006). A study in California (Attles, 1997) analyzed test results of seven homeless children on the California Achievement Test and compared them to the district means. Homeless children consistently scored below the district mean in academic achievement in the eight areas assessed: word analysis, vocabulary, comprehension, spelling, language mechanics, language expression, mathematics computation, and mathematics concepts and application. Homeless children had particular difficulty with word analysis, vocabulary, language mechanics, and language expression. These students performed between 2 and 5 years below grade level for language mechanics. In the category of language expression, four of the seven students also scored 2 to 5 years below grade level. The differences in mathematics were fewer. Students lagged behind, at most, one year (Attles, 1997).

Homeless or low-SES children are at a much greater disadvantage than those from middle- or high-SES. Without their basic needs of shelter, food, and clothing met, the homeless child cannot focus on the need for an education. In 2006, 87% of homeless children were enrolled in school; only 77% attended school regularly. Depending on the specific shelters and their housing situation, the children moved quite frequently. Half of the homeless children attended three different schools in a year (NCH, 2006). In comparison, Rothstein (2004) found only 10% of children in middle-class families had attended three schools by third grade. According to Barton (2003), 41% of children who moved frequently performed below grade level in reading and 33% below grade level in mathematics. Of students that did not change schools, 26% worked below grade level in reading and 17% below in mathematics (Barton, 2003). Students who moved frequently felt separated and less engaged in the school (Vail, 2003).

Seccombe (2002) observed that the longer a child was in the conditions associated with poverty, the greater the negative consequences for the child. Students who lived in poverty for a long duration scored 6 to 9 points lower on IQ, verbal ability, and achievement tests than children who were never poor (Smith et al., 1999). Living in persistent poverty also showed stronger negative effects as the child got older. Children who remained in poverty achieved less academically (Hanson et al., 1999).

Poor Student or Poor School?

Two questions, which should be asked when comparing achievement and SES, are (1) Is low achievement due to the student's family income level? (2) Or is low achievement due to the child being at a low achieving or poor quality school? (Fong, 2003) The previous pages have addressed the first question. To answer the second question, the following research sources have been summarized.

Starting in preschool, poor and low-income children were more likely to attend early childhood programs of lower overall quality. Klein and Knitzer (2007) found that classrooms with 60% of the children from low-income homes possessed significantly lower quality indicators of teaching, teacher-child interaction, and materials for learning than classrooms with fewer low-income children. An in-depth analysis reviewed 103 effectiveness studies (Opdenakker, Van Damme, De Fraine, Van Landeghem, & Onghena, 2002). According to this analysis, 18% of variance in achievement resulted from differences among schools, and after holding constant student ability and SES, an eight percent variance still existed (Opdenakker et al.).

In a study by the Bay Area School Reform Collaborative (1999), 51% of student achievement was attributed to in-school factors as compared to 47% attributed to out-of-school factors. In-school factors, such as teacher expertise and instructional practices, were crucial to the achievement of students. Erbe (2000) considered school climate, teacher beliefs, and student SES when analyzing mathematics achievement in Chicago Public Schools. The study revealed that school climate variables accounted for about 19% and teacher beliefs about 24% of the variance in mathematics scores on the Illinois Goals Assessment Program (IGAP). Students' SES contributed to 57% of the variance (Erbe, 2000). In this case, SES affected achievement more than the school. Still, the poor quality of schooling is an important factor in student achievement.

Students in poverty attending high-poverty schools were doubly at risk. Schools with more than 40% of the students in poverty showed a sharp decline in student achievement (WCPSS Evaluation and Research Department, 1999). If either class or the class's mean SES was low, then the achievement of the students was scattered, and a large variance existed. If the mean SES was high, then the scores were more homogenous and little variance occurred (Opdenakker et al., 2002). Thomas and Stockton (2003) examined the scores of more than 100,000 fourth-grade students. Students in low-SES classrooms had significantly lower gains on the Texas assessment than students in higher SES classrooms (Thomas & Stockton, 2003).

Regardless of SES, students attending a poor area school scored lower on all areas of criterion-referenced reading and mathematics exams. Hoff (1997) found the "A" student in a poor area scored at the 36 percentile on standardized mathematics and reading tests. In comparison, the "A" student in a wealthy area achieved greater, with an average of 87 percentile in mathematics and 81 percentile in reading (Hoff, 1997).

Using data from the Third International Mathematics and Science Study-Repeat (TIMSS-R), differences between schools with high-SES students and schools with low-SES students were found. Students attending high-SES schools had greater achievement when compared to students with the same SES level but in lower SES schools (Choi & Kim, 2006). Thus, the schools' overall SES levels made a difference in the achievement level of students. However, to make some changes, often more resources are needed.

Funding in Schools

The well-known 1996 Coleman Report suggested poverty levels, family environment, and community involvement affected student achievement more than school expenditures (Mulvenon et al., 2001). Using funding data and poverty rates, Payne and Biddle (1999) uncovered a statistically significant relationship between school funding and childhood poverty and student achievement. When comparing mathematics achievement of eighth-grade American students to other countries, students in wealthy school districts with low student poverty matched up to students in other countries, such as the Netherlands or Hungary, and ranked second highest in the world. But if the comparison used the scores from children in poor school districts with high student poverty, then the United States would be equivalent to the third world countries, such as Nigeria and Swaziland, and ranked third from the bottom (Payne & Biddle, 1999). States with higher per-pupil expenditures and prekindergarten students, but lower pupil-teacher ratios and teacher turnover achieved higher National Assessment of Education Progress scores (Grissmer et al., 2000).

Unlike most other countries, in the United States is funded at the state level, and, therefore, unequally. The wealthiest communities spent at least 10 times more per pupil than the poorest (Darling-Hammond, 2004). The states with more funding per pupil, smaller student-to-teacher ratios, and more public prekindergarten classes attained higher student achievement (Books, 2004). Schools with more wealth achieve more.

In the case of mathematics, poor schools lagged in mathematics achievement scores. Schools lacking funding did not organize the curriculum, find the resources necessary, offer competitive salaries, sustain professional development, and provide stable environments which promote learning and teaching (Books, 2004). The biggest difference between schools with adequate or better funding and those deficient in funding pointed to the quality of teachers. According to Education Trust (1998), if the teachers in a poor school equaled the caliber of teachers in an affluent school, then the achievement gap would be narrowed. Poor schools generally employed teachers with less experience who were less prepared to teach. Low-income students need teachers of a higher quality with better credentials, more experience, higher education levels, and better professional development (Education Trust, 1998). Haycock (2001), determined that the top third of all teachers helped children grow academically up to 6 times that of the bottom third of teachers.

Education Trust (2005b) calculated that about $900 less per year was spent on each student in the school districts with the most low-SES students as compared to school districts with the least number of low-SES students. Research (Betts, Rueben, &

Danenberg, 2000) showed that economically disadvantaged students do not have equal resources allocated to them. Schools with more low-income students had fewer teaching resources as measured by teacher education, experience, credentials, and availability of Advanced Placement courses (Betts et al., 2000). Unfortunately, the schools with the most difficult children to teach (high poverty, high minority) were given no additional funds nor were gains in achievement seen (Lee, 2006).

For 2005 in Texas, $588 less (total dollars including federal, state and local money) was spent on low-poverty school districts. (These numbers were not adjusted for low-income students.) When looking at the per-student funding gap for low-income students in Texas, a $1,205 gap existed. Thus, the disparity between high-SES and low-income classrooms of 22 students each equaled a difference of $26,510. The discrepancy between two typical elementary schools of 400 students meant $482,000 (Education Trust, 2005b). This considerable amount of money could have funded several beneficial programs for low-income students.

A lawsuit in New York showed the total funding from the federal, state, and local governments per student in the wealthiest school districts of New York totaled $17,000. The funding for the poorest schools amounted to only $6,000. Across the nation, the wealthiest districts spent 56% more per student than the poorest school districts (National Black Caucus of State Legislators, 2001). Schools serving children in poverty ought to have more funding or at least the same amount as schools serving wealthy students.

Ethnicity, SES, and Achievement

Innate ability and genetic factors do not cause the achievement gap, but ethnic differences in family income and parent education explain a part of the gap (Kober, 2001). Research showed close links between socioeconomic status of a child's family and ethnicity. Ties to ethnicity were discovered between school readiness and socioeconomic status (Rouse, Brooks-Gunn, & McLanahan, 2005). Over the last 20 years, the achievement gap on various subject tests and the Scholastic Achievement Tests between minority students and their White peers remained the same (Sirin, 2003). All subgroups of students increased in average achievement levels (Braverman, 2001). Because a gap was present in achievement between minorities and White students, when achievement rises, minority students must improve at a faster rate in order to narrow the gap (Braverman, 2001). Minority students, mostly Hispanic and African American, make up the majority of the children in poverty (Shannon & Bylsma, 2002). In 2006, of the children in poverty, 39% were White, 31% were Hispanic, and 23% were African American (National Center for Children in Poverty, 2006). More minorities lived in deep poverty with incomes less than 50% of the poverty level (Seccombe, 2000).

Many minority students attend schools where minorities form the majority of the student body. Seventy-three percent of African-American fourth-grade students attended schools with more than 50% eligible for free or reduced-price lunches (Bennett et al., 2004). The Education Commission of the States (2003) reported the average African-American or Hispanic high school student achieved at about the same level as the average, but lowest quartile of achievement for White students (Manning & Kovach, 2003). The discrepancy in performance between minority students and White students in the core academic subjects correlated directly with low-quality education found in the nation's poorest urban schools (Education Trust, 2005a).

Using the Early Childhood Longitudinal Program (ECLS) Kindergarten Cohort data, African Americans achieved 0.56 standard deviations below the national average in reading and 0.68 standard deviations below average in mathematics. Hispanics achieved 0.69 standard deviations below the national average in reading and 0.72 standard deviations below average in mathematics (Lee & Burkam, 2002). The same effect size differences of about half a standard deviation were found for children at the beginning of kindergarten in reading and mathematics. Effect size differences were generally larger for mathematics than for reading (Lee & Burkam, 2002).

Results from the National Assessment of Educational Progress (NAEP) showed differences in reading achievement among ethnicities. The 2005 NAEP fourth-grade data for Texas showed two percent of African-American students scored Advanced and 12% ranked Proficient in reading. Three percent of Hispanic students attained Advanced and 16% Proficient, and, of the White students, 10% ranked Advanced and 34% Proficient (Education Trust, 2006). On the 2005 TAKS reading test, the African-American students achieved the least. Eighty-eight percent of White fourth-grade students met the standard, while only 69% of African-American and 73% of the Hispanic students met the standard (Education Trust, 2006).

The 2005 NAEP data for eighth-grade students in mathematics painted a very similar picture to reading. Expectations of Basic, Proficient, and Advanced for eighth-grade students were increased due to the change in grade levels. Basic level achievement began with a score of 262, meaning students exhibited evidence of conceptual and procedural understanding. The student understood the arithmetic operations on whole numbers, decimals, fractions, and percents. For Proficient level, beginning at 299, students applied mathematical concepts to more complex problems. They conjectured and defended their ideas and gave supporting examples. They understood connections among fractions, percents, and decimals, as well as algebra and basic functions. Inferences from data and graphs, application of properties in geometry, and usage of technology tools were required to score Proficient. Advanced level scores started at 333. Students who were Advanced reached beyond the basics and synthesized concepts and principles. They probed examples and counterexamples to create generalizations. They had number sense and geometric awareness, abstract thinking, and unique problem-solving techniques (NCES, 2006b).

In 2005, the Texas NAEP performance results in mathematics indicated that the White students found the most success, with 7% Advanced and 30% Proficient. African-American students had 1% Advanced scores and 8% Proficient while Hispanics had 1% Advanced and 12% Proficient (Education Trust, 2006). Overall, the minority students performed better in reading than in mathematics. Similar percentages resulted on the 2005 TAKS mathematics for eighth-grade students. Seventy-five percent of White students met the standard while only 44% of the African Americans and 50% of the Hispanics met the standard (TEA, 2005b).

Data from the Children of the National Longitudinal Survey of Youth (NLSY) determined that by eliminating differences in income and wealth between African Americans and Whites, the children’s achievement on the Peabody Picture Vocabulary Test (PPVT) only lessened the gap by less than 1 point (Jencks & Phillips, 1998a).

Likewise, the achievement gap only decreased slightly when African-American and White students attended the same schools and had the same amount of schooling (Jencks & Phillips, 1998b). In *The Black White Test Score Gap*, Jencks and Phillips (1998b) stated their belief that teachers, when educating African-American students, lowered their expectations.

Research conducted on the 1998 Early Childhood Longitudinal Study showed that African-American and Hispanic kindergarteners scored two-thirds of a standard deviation below Whites in mathematics and just under half of a standard deviation below Whites in reading (Duncan & Magnuson, 2005). The same gaps in academics related to the SES of the family. The SES levels of minority students averaged lower than White students' SES. The SES of African-American kindergarteners was more than two-thirds the standard deviation below Whites (Duncan & Magnuson, 2005).

In fourth-grade reading and mathematics, the NAEP data revealed gains for students in high-poverty schools. The African-American and Hispanic students aggressively gained 33 points and 26 points, respectively, in mathematics from 1990 to 2005 (USDOE, 2006). Reading achievement increased 8 points for African-American students and 7 points for Hispanic students. From 2000 to 2005, minority student achievement increased sharply. African-American children increased their achievement by 10 points in reading and 17 points in mathematics. Hispanic students gained 13 points in reading and 18 points in mathematics (USDOE, 2006).

Among third-grade students in high-poverty schools, several gaps in reading and mathematics achievement were found. African-American students fell 13 months behind in reading and 12 months behind in mathematics when compared to the average third grader. Hispanic students lagged 6 months behind in reading and mathematics and gained at a rate of about 3 additional months per year (Wong et al., n.d.). These minority students continued to trail their White peers in achievement.

Projected out to 2014, 100% of students in South Carolina who are paying full price for lunch, but only 58% of free or reduced-price lunch students, will score Proficient or Advanced on the fourth-grade mathematics NAEP (South Carolina Education Oversight Committee, 2004). For South Carolina eighth-grade students in 2014, 82% of the full-price lunch students but only 34% of the free or reduced-price lunch students will achieve Proficient or Advanced on the mathematics NAEP. Using the same criteria for reading, of the students paying for their lunch, 41% will score Proficient or better while only 23% of the students receiving free or reduced-price lunches will attain Proficient or better (South Carolina Education Oversight Committee, 2004). South Carolina projections by ethnicity indicate the gap between White and African-American children will continue to increase. In 2014, 83% of White students and only 23% of African-American students in eighth grade will score Proficient or Advanced on the mathematics NAEP. In reading, if the current trends continue, only 47% of White students and 12% of African-American eighth-grade students will reach Proficient or better (South Carolina Education Oversight Committee, 2004).

SES and ethnicity combined form the largest impact. The low-SES African-American and Hispanic students attained about 1.4 standard deviations in mathematics and 1.2 standard deviations in reading below the high-SES White students (Lee & Burkam, 2002). In North Carolina, for mathematics and reading, the students who achieved the highest were White students who pay full price for their lunches while the lowest achieving students were African-American students receiving free or reduced-price lunches (Thompson & O’Quinn, 2001). Even in wealthy suburbs, African-American students were less successful than their White peers (Rothman, 2002).

Research on the test score gap identified African-American parents as less wealthy than White parents (Jencks & Phillips, 1998b). From the Children of the National Longitudinal Survey of Youth (NLSY) data, the average African-American child, if compared to the average White child, would rank at the 19th percentile of the White distribution. If the average family income was used, the typical African-American child on the CNLSY fell at the 16th percentile of the White income distribution (Jencks & Phillips, 1998b). From the 1998 NLSY, a White family’s median income equaled $18,161, while the African-American family’s wealth amounted to merely $1,161 a year. Even looking at the average income over a child’s lifetime, the Black-White gap decreased by only about 0.8 points on the Peabody Picture Vocabulary Test (Jencks & Phillips, 1998b).

In order to gain a true picture of SES on achievement, Caldas and Bankston removed the effect of racial composition of the students by separating the students into African-American and White groups. Caldas and Bankston’s findings from the Grade 10 Louisiana Graduate Exit Examinations revealed a strong tendency for poor children to attend schools where the other students were disproportionately poor. In other words, students most often attended schools with same SES peers. The lower SES of students negatively affected academic achievement. Thus, poor children who attended a school with a high percentage of other poor students generally scored lower on assessments.

Controlling for ethnicity, African-American students achieved less than their White peers (Caldas & Bankston, 1997).

Sirin (2003) believed that past research was skewed because SES has shown to be a better predictor of achievement in White students than in minority students. His research from 1990-2000 showed minority students did not benefit from their family background (which includes parent's education, income, and occupation) as much as White students. From White student samples, the mean effect size was 0.241, whereas for the minority samples, the mean was 0.157. An increase in the number of minorities in the sample decreased the correlation between SES and school achievement, $\beta = -0.36$.The culture of the family, rather than ethnicity of a student, caused low achievement (Sirin, 2003).

The 1966 Coleman Report stated the integration of African-American children into White schools would have little or no effect on student achievement. The Report also explained differences in academic achievement between Whites and African-Americans as a byproduct of a culture of poverty (Schugurensky, 2002). Factors of poverty could not be separated from factors that were part of a culture. Hence, holding ethnicity constant was very important to this study to ensure that the results were due to differences in SES rather than ethnicity.

Is there an Achievement Gap?

Generally, the research (Paris, 2003; Mulvenon et al., 2001; Carmichael, 2005) showed the same results. The free-lunch group achieved the least on the testing. The reduced-price lunch group achieved better, and the non-eligible students performed the best. In the wealthier neighborhoods, in all lunch eligibility groups, students achieved better than those living in the poorer neighborhoods (Schellenberg, 1998). While the research on the previous pages concluded that a large achievement gap exists, the following research showed otherwise.

Sorhaindo (2003) measured the achievement of fourth- and eighth-grade students using the Stanford Achievement Test. While the not economically disadvantaged students attained higher scores than the students receiving reduced-price lunches and free lunches, the effect sizes were small and showed only a minor difference that could be accounted for by poverty (Sorhaindo, 2003). Similarly, White, Reynolds, Thomas, and Gitzlaff (1993) claimed the previous studies concerning socioeconomic status (SES) were not accurate. Low SES did not predict low achievement on standardized testing (White et al.).

Raudenbush (2004) found all students improved at about the same rate. The early elementary-school years showed substantial differences in proficiency between students at low-poverty and high-poverty schools because of the differences in ability levels among the kindergarteners that enter school for the first time. But, the learning rates were the same for all economic levels. For middle schools, his research demonstrated that school poverty concentrations were unrelated to growth rates in mathematics. In reading, schools with lower poverty levels displayed less growth than the high-poverty schools, but the difference was minimal (Raudenbush, 2004).

Likewise, Shannon and Bylsma (2002) proved the achievement gap neither narrowed nor improved. According to research by Washington State, very little change has occurred in the size of the achievement gap since 1992. In reading, the minority groups made greater gains than the White students in every grade, but the average rates of improvement increased proportionally for all ethnicity groups. Improvement occurred in all situations (Shannon & Bylsma, 2002).

The factors of poverty affecting achievement were interrelated and difficult to separate. Most factors fell into two large categories, those within the schools' control and those out of the schools' control. Forty-seven percent of student achievement was attributed to out-of-school factors, such as socioeconomic status, parent's educational levels, and home environment, while 51% of student achievement was attributed to in-school factors (Bay Area School Reform Collaborative, 1999).

Closing the Achievement Gap

Select schools narrowed the achievement gap by following similar principles for educating students from poor backgrounds. Simpson-Waverly Elementary School in Hartford, Connecticut was a National Blue Ribbon school. Ninety-four percent of the students qualified for free or reduced-price lunches. The principal held high expectations for the teachers and set a clear vision. The teachers, in turn, set high standards for the students and expected them to achieve their goals. Hence, the school achieved one of the nation's highest honors as a Blue Ribbon School (USDOE, 2003). Low expectations for students of low socioeconomic status cause students to underachieve. Good teachers have set high expectations for their students and found more success (Singham, 2003).

After interviewing and observing at nine urban, high-poverty, high-achieving elementary schools, Johnson & Asera (1999) found several similarities. First, the school leaders formed an "important, visible, yet attainable goal" (Johnson & Asera, 1999, p. 3). Once that goal was achieved, school leadership created a more ambitious goal. Also, school leaders did not waste time and energy on conflicts, but rather focused on the children and their achievement. The students developed a sense of responsibility for their behavior which led to fewer discipline issues. Next, the instruction and assessment were aligned so teachers knew exactly what needed to be taught and what the students had to learn. With the curriculum in place, the leadership of the school made sure teachers had more instructional leadership and ensured that teachers had all the materials and equipment they needed for teaching. Included in the teachers' schedules were more opportunities for collaboration and planning as teams. Additional time was also created for instruction by adjusting schedules or extending day activities. In addition, educators worked with parents to gain their confidence and respect. Finally, all schools persisted through difficulties and failures (Johnson & Asera, 1999). A total focus on goals related to student achievement was the key to success in high-poverty, high-achieving schools.

With these principles, Baskin Elementary School in San Antonio, Texas, increased the percent of all students passing the Texas Assessment of Academic Skills (TAAS) for reading, mathematics, and writing by 49.8% from 1994 to 1998. For economically disadvantaged students, achievement increased 56.7% from 1994 to 1998 on all three tests (Johnson & Asera, 1999). The TAAS was the Texas examination prior to the TAKS. All nine schools in Johnson and Asera's studies demonstrated similar successes and, thus, were included in the study.

In *No Excuses Lessons from 21 High-Performing, High-Poverty Schools*, seven common characteristics were listed. The research showed principals possessed the freedom to decide how to spend their funding, whom to hire, and what to teach. Second, principals gauged success on measurable goals, which established a culture of achievement. School staff had a relentless pursuit of excellence, and everyone was held personally accountable. Teaching was not viewed as an 8:00am to 3:00pm job. Third, master teachers brought out the best in the faculty. Master teachers were not necessarily the teachers with seniority but had strong teaching skills. Likewise, the master teachers led the team teaching, conducted peer evaluations, and taught teammates how to teach. Fourth, rigorous and regular testing was conducted in order to continue student achievement. Administering tests three to four times a year yielded data for principals to analyze and review. Principals took the school achievement data personally and felt responsible for the scores. Teachers were tested, as well, through their students' successes and failures. Fifth, achievement was the key to discipline issues. Higher achievement led to fewer discipline referrals. Sixth, teachers worked actively with parents to create a center of learning at home. The school extended learning to the home. Finally, no social promotion was allowed. Failure was not an option (Carter, 2001). These seven principles were common to the 21 schools and principals highlighted in the book. The effectiveness of these principles was demonstrated through the success of schools.

Research through the University of Texas at Austin Dana Center identified 50 schools with a high percentage of students from poverty and high achievement on the state tests. All schools had Title I programs, and more than 60% percent of the students qualified for free or reduced-price lunches. At least 70% of all students passed the Texas Assessment of Academic Skills (TAAS) in reading and mathematics. Researchers selected twenty-six schools to be interviewed. Seven common themes helped schools succeed. First, all school personnel focused on the academic success of every student. Teachers looked for what was best for all students. The school mission tied into every aspect of the school. Second, no excuses were accepted. Teachers believed all students could succeed. Regardless of a child's poverty level, difficult situation, or family background, each child could learn. Also, if something was needed, the school found a way to get it. Staff and faculty members wrote grants, juggled budgets, and sacrificed to find the funding. High expectations were set for students and teachers. Third, experimentation was allowed and encouraged. Teachers tried another method if current strategies were not working. Fourth, all staff members were included in problem solving, regardless of job titles. Everyone helped children to succeed. Fifth, parent outreach was a strong component of schools. Open door policies were set, and every school created a sense of family. Students, parents, and all school personnel were made to feel valued at the school. Sixth, collaboration and trust were expected. Staff shared their successes and concerns and gave each other feedback. Finally, theme seven was a passion for learning and growing. Teachers and principals continuously planned for improvement. The researchers observed self-imposed motivation and pressure. The schools created a true community of learners (Lein, Johnson, & Ragland, 1997).

The commitment and determination of principals and school staff was reflected in the research studies. School leadership sacrificed and adjusted to meet the needs of students, especially those from low-income backgrounds. The gaps narrowed with the implementation of principles and beliefs.

Summary

A complex mix of school, community, and home factors appear to contribute to the achievement gap (Kober, 2001). There is no simple explanation. Issues start with lack of prenatal care for pregnant mothers and span to lack of funding among schools. Research shows each factor causes some difference in achievement, either positive or negative. Unfortunately, no one factor affects the achievement of students in poverty. A combination of circumstances causes poor children to struggle academically. Research points to a gap between students who are low SES versus high SES. However, until this study, no large-scale research has been analyzed to study differences in achievement among students who qualify for free lunches, students receiving reduced-price lunches, and students not economically disadvantaged.

Berliner and Biddle (1995) found the differences in student SES created difficulties in providing quality schooling for children who come to school hungry, with tattered clothing, from neighborhoods of crime and violence, or from homes without the basic amenities. Still, a good education needs to be given to all children, regardless of ethnicity or socioeconomic status. With an education, the possibility of leaving poverty increases greatly (Payne, 2005). The motto of the United States Department of Education is “Providing educational excellence for all Americans.” If this motto is truly the object of American education, then schools need to find methods to level the playing field and guarantee a quality education for all children, especially for those in poverty. The nation cannot raise the level of education and improve student achievement without closing the achievement gap (Kober, 2001).

CHAPTER III

METHOD

General Perspective

This quantitative study examined the difference in the growth in reading and mathematics achievement among economically disadvantaged students as defined by the National School Lunch Program. A large body of research (Denton and West, 2002; Shannon & Bylsma, 2002) has compared students from low socioeconomic status (SES) to those from high socioeconomic status. However, little research has been conducted to differentiate the academic achievement between students receiving free lunches and children receiving reduced-price lunches (Sirin, 2004). This study will analyze the differences in reading and mathematics achievement among three socioeconomic levels of students. Chapter III includes the research context, participants, data collection, variable definitions, and data analysis.

Research Context

This study included Texas major suburban public school students who were administered the Texas Assessment of Knowledge and Skills (TAKS) in 2003, 2004, 2005, and 2006. Texas school districts were selected because Texas has been a model for the No Child Left Behind Act, has been a strong leader in education, and has many students from a variety of backgrounds and socioeconomic levels (Haney, 2000). In addition, the quality of data at the student level was exceptional. By most measures of academic achievement, Texas has proven to be a good representative of the United States (Haney, 2000; Toenjes, Dworkin, Lorence & Hill, 2002).

The Texas Education Agency (TEA) collects a wide range of information on the students in each school in Texas every year and inputs all data into annual Academic

Excellence Indicator System (AEIS) reports. The AEIS reports include disaggregated data showing results from the TAKS, frequencies of students by ethnicity, percentages of students by gender, and other school information. Beginning in 2003, the TAKS reading and mathematics tests were administered to students in Texas public schools. The 2003 assessments required students in Grades 3 to 9 to take the TAKS reading exam. Students in Grades 3 through 11 were required to take the TAKS mathematics exam (TEA, 2005a). State educators and test creators designed the TAKS based on essential elements in the curriculum. The Texas State curriculum is called the Texas Essential Knowledge and Skills (TEKS).

The TAKS results have been reported in scale scores, a statistic that compares scores with the standards. The scale scores compensated for any differences in the difficulty of the items and allowed for direct comparisons of student performance between administrations and among forms of the test (TEA, 2006a). The scale scores ranged from 1000 to 3200 (TEA, 2006a). The scales remained the same for all the Texas state assessments, including the reading and TAKS mathematics (TEA, 2005a).

Individual scores indicated whether a child met the passing standards. Students not meeting the standard in third and fifth grades retook the test (with up to three chances) until they passed, or they opted for grade level retention (TEA, 2006a). For the purposes of this study, scores for third- and fifth-grade students were taken from only the first administration of the TAKS mathematics and reading tests. Second and third administrations of the tests were not included because students experienced more intense tutoring and matured developmentally with the increase in time. The extra opportunities may have biased the test results.

In order to see growth over time, the 2003 individual TAKS scores for third-grade students were analyzed, and the subsequent scores were tracked for three more years. The data ended with sixth-grade scores from 2006. For this study, the researcher requested school districts to provide TAKS reading and mathematics scale scores for individual students from 2003, 2004, 2005, and 2006. Along with the scale scores, each student's ethnicity, gender, and SES were requested. The researcher compared disaggregated data among school districts, students, and subgroups to see if any patterns emerged.

Research Questions

The author addressed the following research questions to examine the differences in student achievement among the three defined economic levels.

1. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?
2. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
3. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?

4. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?
5. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
6. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?

Participants

Five major suburban independent school districts participated in this study and provided a large base of student data. Independent school districts are governed by locally elected board of trustees. The 2006-2007 school year total student enrollment for the districts was 51,573; 54,924; 25,581; 31,215; and 43,815. Student data with TAKS scores for 2003 in third grade, 2004 in fourth grade, 2005 in fifth grade, and 2006 in sixth grade were included into the study. Students with missing data were not included in the study. The school district with the greatest number of participants was District 5, with 2,668 students. The school district with the fewest number of participants was

District 1, with 1,089 students (see Table 4). The number of participants in a school district varied, in part, because of the mobility of the student body. The students in this study took the TAKS reading and/or mathematics exam for four years, from 2003 to 2006. While Hierarchical Linear Modeling recommends 25 to 30 clusters, the researcher used only five clusters or school districts. However, this difference does not impact the results due to the large number of participants.

More students sat for the TAKS mathematics exam than for the TAKS reading exam. The difference was a result of several factors. First, students may be absent for one exam, and, thus, they were not included in the data. Also, students in special education may have been exempted from taking one test. For example, students who have a learning disability in reading may have been administered an alternative exam for reading but took the TAKS mathematics. On the day of the exam, a student who suddenly became ill or could not complete the exam would show as taking the exam but did not receive a score. Ultimately, they would not be included in this study.

Table 4

Student Sample Size by District for TAKS Reading and TAKS Mathematics

Districts	Enrollment PK-12	Reading Frequency	Reading Percent	Mathematics Frequency	Mathematics Percent
District 1	25,581	1,089	11.2	919	9.3
District 2	54,925	2,518	25.8	2,526	25.6
District 3	31,215	1,096	11.2	1,332	13.5
District 4	43,815	2,375	24.4	2,377	24.1
District 5	51,573	2,668	27.4	2,725	27.6
Total		9,746	100	9,879	100

Ethnic demographics of the participants are shown in Table 5. Of all participants, 51.9% were White, 27.9% were Hispanic, 10.0% were African American, and 10.7% were Asian. The American Indian students accounted for less than one percent of the participants with only 31 students.

Table 5

Participants by Ethnicity for TAKS Reading and TAKS Mathematics

Ethnicities	Reading Frequency	Reading Percent	Mathematics Frequency	Mathematics Percent
American Indian	31	0.3	35	0.4
Asian	1038	10.7	1018	10.3
African American	970	10	938	9.5
Hispanic	2590	26.6	2760	27.9
White	5116	52.5	5128	51.9
Total	9746	100	9879	100

About half of the students were male and half were female. For both tests, the male and females were approximately 50%. The details revealed that a few more males than females took both tests.

Table 6

Participants by Gender for TAKS Reading and TAKS Mathematics

Gender	Reading Frequency	Reading Percent	Mathematics Frequency	Mathematics Percent
Male	4876	50.03	4942	50.03
Female	4870	49.97	4937	49.97

The majority of the students was not economically disadvantaged or did not qualify for a lunch discount. The SES of students from 2003, or third grade, was set as the basis for the study. Third-grade SES was utilized because it had the best accuracy. Students in middle school and upper grade levels frequently do not apply for free or reduced-price lunch status because many tend to be embarrassed by their poverty (Rothstein, 2001). Hence, using SES from upper grade levels might have skewed the SES levels. In this case, the percentage of students in each SES level did not change significantly for reading or mathematics (see Table 7). Actually the number of students receiving reduced-price lunches increased in 2005.

Table 7

Percent of Students by SES Levels for TAKS Per Year from 2003 to 2006

SES Level	2003	2004	2005	2006
Not economically disadvantaged				
Reading	71.3	71.1	70.1	70.2
Mathematics	70.5	70.5	69.5	69.4
Free lunch				
Reading	22.9	23.5	22.5	22.7
Mathematics	23.6	24.6	23.1	23.5
Reduced-price lunch				
Reading	5.8	5.3	7.4	7.0
Mathematics	5.8	4.9	7.4	7.1

Some of the students had incomplete data and were not included in the study. None of the districts' populations were static. The experimental mortality did not affect the study, due to the large sample size. For this study, some student data were missing at random. The data might be missing due to errors such as equipment malfunctions, incorrect bubbling on test answer documents, or student illness. Regardless of the reason, students with missing data were omitted from the study.

A few exemptions from taking the TAKS test were possible. Students were exempted if they were new to the country and qualified as a child with limited English proficiency. In this case, they were exempt for up to three years. Also, some children who qualified for special education were exempt from the test. Exemptions were made by an Individual Education Plan (IEP) committee and were dependent on the child's capabilities. Students who took the State Developed Alternative Assessment or the Spanish TAKS or were exempt for any other reason were not included in this study. Students who qualified for special education but did take the TAKS exam were included in the study. The study also included any child who took the exam with allowable accommodations according to the TEA. Some of the allowable accommodations included small group or individual testing situations, transcribing of information, or oral administration of the mathematics test. The following section describes the data collection method.

Data Collection

The data needed for this project were collected from major suburban Texas school districts. Requests to ten school districts for individual student TAKS data from 2003 to 2006 were made. Five school districts responded. The school districts asked not to have their names specifically mentioned. The data were not public information due to the confidentiality of student scores. In order to maintain student confidentiality, the identification numbers of the students were altered by the school districts, thus masking the students' identities. School districts obtained individual student data from TEA, the governing body which created the Texas state curriculum (Texas Essential Knowledge and Skills) and the TAKS. The TAKS individual student data were put into a spreadsheet and then analyzed with Statistical Package for the Social Sciences (SPSS) version 14.0. The collected data were also analyzed with hierarchical linear modeling (HLM) to determine if differences existed in the growth patterns of the subgroups of students. HLM was completed using Hierarchical Linear Modeling (HLM 6) statistical software, designed by Raudenbush, Bryk, and Congdon.

Variables Examined

Dependent Variables

The dependent variables in this study were student academic performance in reading and mathematics, as measured by the TAKS. The students' academic performance was represented by scale scores on the TAKS reading and mathematics over time from 2003 to 2006 and from Grades 3 to 6. The TAKS was a comprehensive testing program for Texas public school students in Grades 3 to 8 and at graduation. The TEA designed the TAKS to measure the extent of what a student had learned, understood, and applied in regards to the important concepts and skills expected at each grade level tested. The scale scores compared results with the standards and took into consideration the differences in the difficulty of the test variations for each administration. This study was conducted at the student and district levels. The students were categorized into three groups based on their lunch payment status: free lunch, reduced-price lunch, and not economically disadvantaged.

In certain years of the TAKS exam, the student must pass in order to be promoted to the next grade level as part of the Texas Student Success Initiative. In third grade, a student must have passed the reading test. Fifth-grade students must have passed the reading and mathematics tests. Fourth and sixth grades did not have any tests that must be passed in order to be promoted. The student had three opportunities to meet the minimum standards on each test. After the third attempt, a grade placement committee, consisting of the parents and school staff, was formed. If the student failed to pass the third administration, the student should be retained in Grades 3 and 5. Students who repeated a grade level were not included in this study. If they repeated a grade level, four years of different grade level data did not exist. Also, only the first test administration's score was used in this study. The first score was the best comparison across all students because all students had about the same amount of time for learning, test preparation, and maturation. After a student failed an exam, the school began an intensive remediation program to help the student improve academically. This intensive, and individualized, tutelage would have skewed the data results if the second or third scores were used. Likewise, the repeated testing would be a threat to internal validity.

Independent Variables

Ethnicity – The following ethnicities are considered subgroups in Texas: White, African American, Hispanic, Asian-Pacific Islander, Native American, and other. The subgroups of ethnicities were examined to find if any one group had a significant difference in achievement. Native Americans, Asians, African Americans, Hispanics, and Whites were coded as 1, 2, 3, 4, and 5, respectively, for the data analysis.

Expenditures by Compensatory Education- Percent of All Funds – The TEA requires districts to keep a budget, which includes delineated expenditures for specific programs, such as compensatory education. Compensatory Education includes programs and services designed to enhance the regular education program for students identified as at risk for dropping out of school. The goal of Compensatory Education is to raise the academic achievement and lower the drop-out rate for these students. Compensatory Education includes a wide range of services from Title I classes to additional teaching assistants in the classroom (TEA, 2003). Funds allocated to Compensatory Education are not always used on students who are at risk for failure. For example, the teaching assistants who are paid with Compensatory Education monies might help a student who is misbehaving and disruptive to the classroom environment rather than a child who is at risk for failure.

Gender – The child's gender, either male or female, was identified. The subgroups of male and female were analyzed for any significant differences in regard to results for socioeconomic status. Males were coded as 1, and females were coded as 2.

Socioeconomic status (SES) – In the public school system, a student's qualification for the district's meal program was the measure utilized to designate a student's SES. In this study, three categories were used: eligible for free lunch, eligible for reduced-price lunch, and not economically disadvantaged. The child's SES in third grade determined the child's SES for the years analyzed. A child who was considered low SES must have been identified as eligible for either free or reduced-price lunch. Students qualifying for free or reduced-price lunches must have completed the National School Lunch Program application and been eligible based on their family income. Free lunch was available for children whose families earned incomes at or below 130 percent of the poverty level. Reduced-price lunch, which could cost no more than 40 cents, was available to children from families whose income fell between 130 percent and 185 percent of the poverty level. For the 2002-2003 school year, a four-person household made $18,400 or below annually to qualify free lunch prices (U.S. Department of Health and Human Services, 2003). The 2002-2003 school year was used because it was the first year of the study, and students were more likely to apply for lunch discounts at a younger age. SES was also calculated for the entire district and used as a district-level variable. Students receiving free lunches were coded as 1. Students with reduced-price lunches were coded as 2. Not economically disadvantaged students were coded as 3.

Data Analysis

This causal-comparative research study determined if a relationship existed between a child's socioeconomic status and his achievement on standardized tests. Several methods of analyzing the same data were used in order to ensure all the research questions were fully answered. Threats to external validity were minimal due to the use of archival TAKS data.

By looking at the TAKS data from 2003 to 2006, the researcher tracked and plotted each student's progress. Using this time series data, the students' scale scores were then averaged and differences in achievement among groups were identified. To find the mean of the group scores, each student's scale score was summed, and the sum was divided by the number of students in the group.

To obtain precise answers, descriptive statistics included measures of central tendency and measures of variability. Correlational statistics yielded coefficients of correlation which showed the strength and direction of the relationships between different sets of data or predicted scores on one distribution based on the knowledge of scores on another. The descriptive statistics and the correlations were found using SPSS version 14.

The following table shows the minimum and maximum scores attainable on the TAKS tests for 2003 through 2006, as well as the score needed to meet expectations and to receive a Commended score. A scale score of 2400 was the Commended expectation for each grade level and for each subject test. The percentages from each socioeconomic status group were compared to each other and then analyzed for any significant differences.

Table 8

TAKS Reading and Mathematics Standards

Test	Met Expectations	Commended	Minimum Score	Maximum Score
Reading 2003	2029	2400	1353	2623
Mathematics 2003	1986	2400	1207	2727
Reading 2004	2069	2400	1343	2651
Mathematics 2004	2047	2400	1257	2699
Reading 2005	2100	2400	1126	2714
Mathematics 2005	2100	2400	1068	2823
Reading 2006	2100	2400	Not available	Not available
Mathematics 2006	2100	2400	Not available	Not available

(TEA, 2006b)

As part of the data analysis, Cohen's *d* effect sizes were used (Cohen, 1988). A Cohen's *d* effect size can be found by taking the difference between two means and dividing by the standard deviations of the means. In this case, the effect sizes are measuring the standardized difference between the mean scale scores on TAKS reading and TAKS mathematics. A Cohen's *d* effect size is said to be small if it equals 0.2. A medium effect size is 0.5. A large effect size is 0.8 (Cohen, 1988).

The data were also analyzed using multilevel growth modeling on the four years of TAKS scale scores for each group of students: those receiving free lunches, those receiving reduced-price lunches, and those not economically disadvantaged. The growth curve models were created using Hierarchical Linear Modeling (HLM 6) statistical software (Raudenbush, Bryk, & Congdon, 2001).

In order to see change over time, growth modeling must be used. This type of modeling is a powerful tool to analyze, simultaneously, relations between unobserved variables considering a specific measurement model. An underlying mean and covariance structure is often assumed to be from a single population, but this assumption is often unrealistic and can produce misleading results (Reinecke, 2006). Hence, the standard technique of repeated-measures of analysis of variance (MANOVA), which is commonly used to make multiple measurements and is often used on time series data, was not used. Growth modeling reveals latent variables that might be unobserved using ordinary statistics. A MANOVA will not reveal the differences that can be found in HLM.

Likewise, the traditional methods of analysis, such as regression, either treat the district as a unit of analysis (which ignores the differences among students within districts) or treated the student as a unit of analysis (which ignores the nesting within the districts). Neither of these approaches was found to be acceptable (Braun, Jenkins, & Grigg, 2006). In the first case, valuable information would be lost, and the fitted school-level model would misrepresent the relationships among variables at the student level. In the second case, the assumption was made that all the observations were independent of one another. However, students that attend the same district may share many educationally relevant experiences that can affect academic performance. Therefore, scores on academic evaluations for students in the same district would not be independent, even after adjusting for student characteristics. Violation of the independence assumption would mean, in most cases, that bias existed in the estimates of standard errors of means and regression weights related to academic performance. This bias would create situations in which statements of significance could occur too often and, ultimately, cause Type I or Type II error rates, which are quite different from nominal ones (Braun et al., 2006). In other words, errors occur if student scores are treated as totally separate. For the most part, students experience similar situations, and their scores will reflect the quality of the instruction.

The data in this study have a nested structure. In other words, the student scores are nested within students, and students are nested within school districts. This structure means that observations are not independent. People who are from the same environment tend to share the same characteristics. Thus, hierarchical linear modeling (HLM) is a powerful statistical method to analyze the environmental variables that affect the individual outcomes. While there are other adequate procedures for analyzing hierarchical data, hierarchical modeling requires few assumptions and is most appropriate for this study. HLM uses more than two data points and allows for the spacing of the data points to vary over time. HLM also estimates how reliably change is being measured, describes the structure of a mean growth trajectory, estimates the extent of individual variation around mean growth, and assesses the reliability of measures for studying status and change. Other key uses of HLM include the estimated correlation between entry status and rate of change and the examination of how background variables influence change (Prevention and Early Intervention of Developmental Disabilities, n.d.).

HLM analysis allowed for independent yet simultaneous results to be found from the direct effects of variables on multiple levels. Hence, a three-level HLM was designed for this study to determine differences among the student achievement growth in test scores over four years, among the individual students, or among the districts. The student characteristics examined were ethnicity and socioeconomic status (SES). The district characteristics analyzed included district-wide ethnicity percentages, district-wide SES percentages, and the district-wide percent of expenditures for compensatory education.

The HLM model follows a three-level approach of multi-level analysis. Level 1 analyzed the repeated observations over time or the test scores, which were nested within level 2, individual students. The students were, in turn, nested within level 3, the districts. In the first level, the analysis produces the unconditional model with no independent variables at the student and district levels. The amount of variation among the districts and the reliability of each district sample mean were provided at this level. At the second level (random coefficients model), student-level variables were added to the null model to determine whether their relationship with achievement varies significantly among the students. With only the student level outcome measures, herein TAKS reading and mathematics scores, this model provides a measure of variances within and among students for reading and mathematics achievement. The last stage refers to the full model (intercepts and slopes as outcomes). District level variables were added to the model. Intercepts marked the starting point of the achievement level of a particular group. The slope shows the growth rate of the group of students over the four-year period of the study. The slope predicts the achievement of each level of students, as well.

The model was centered around the grand mean. When a covariate, an independent variable or predictor, was introduced at the student level, it was centered at the mean over all students in the population. In particular, for each district the intercept of the level 1 model was adjusted for the linear regression of the test scores on that variable (Braun et al., 2006). In other words, interpretations referred to the population, i.e., students receiving free lunches, students receiving reduced-price lunches, and students not economically disadvantaged in the population. The following specifies the model used.

Level 1 (the within subjects growth model):

$$\hat{Y} = \pi_0 + e$$

$\hat{Y}$ stands for the TAKS scores. π_0, the intercept, represented the predicted entry level, i.e., the predicted 2006 scores for each student based on his or her own 2003 to 2006 growth trajectory. e was an error term.

Level 2 (the student level between subjects model):

$$\pi_0 = \beta_{00} + R_0$$

The predictor in this model was membership in the SES groups between 2003 and 2006. β_{00} was the intercept or the level at which the economically disadvantaged students achieved at the start of the study in 2003. R_0 was an error term.

Level 3 (the between districts model):

$$\beta_{00} = \gamma_{000} + \upsilon_{00}$$

In this model, γ_{000} was the intercept and υ_{00} was the error term.

The same HLM models were used for both reading and mathematics. The results from the analysis of the data are presented in Chapter IV. The descriptive statistics are shown, followed by the HLM outputs. The descriptive statistics include scale scores by mean and standard deviations, as well as differences between the means.

Summary

In this chapter, the methodology utilized in this study was described. The participants for the study consisted of students from five major suburban school districts. Data for almost 10,000 students were made available to the researcher. The student variables were scale scores from TAKS reading and mathematics exams. Subgroups based on SES, ethnicity, and gender were created to determine if differences in achievement were based on any of those variables. District variables in compensatory education expenditures, ethnicity, and SES were also examined. The researcher reviewed the descriptive statistics as well as the three-level HLM results. Appropriate analysis of the data was important to ensure that all angles are examined. Latent differences in the data could account for important findings.

CHAPTER IV

RESULTS

This chapter presents the results of data analyses exploring the influences of socioeconomic status (SES) on children's academic achievement. Outcome variables of interest include reading and mathematics scale scores measured by the Texas Assessment of Knowledge and Skills (TAKS) over a four-year period. The following research questions guided the study:

1. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?
2. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
3. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?
4. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts

who were not economically disadvantaged and students who received free lunches?

5. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
6. Over a four-year period from Grades 3 to 6, does a difference in the rate of academic growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?

To answer these questions, the researcher used descriptive statistics and HLM. First, the descriptive statistics, including sample characteristics, frequencies, means, and correlations, were reported. The descriptive analyses were conducted using SPSS 14. Next, Hierarchical Linear Modeling (HLM 6) statistical software was used to analyze the changes in achievement growth in reading and mathematics. HLM allows for the study of relationships at three levels in a single analysis without ignoring the variability associated with each level of the hierarchy. Since the data in this study has a nested structure (test scores within students and students within districts), HLM was preferred for the analyses. The results from the analysis of the data are presented below. Tables and figures were included to visually display findings.

Reading

Descriptive Statistics

The population consisted of students in selected Texas major suburban school districts during the period 2003 to 2006. The sample of students included those with a TAKS score for each year from 2003 to 2006. The majority (71.3%) of the participants were not economically disadvantaged. The 2,228 (22.9%) students receiving free lunches outnumbered the students receiving reduced-price lunches, 568 or 5.8%.

Tables 9, 10, 11, and 12 display TAKS scale score means separated by SES. In 2006, the not economically disadvantaged group's mean score was 2443.42 with a standard deviation of 185.66, higher than the Texas commended rate. Commended referred to high academic achievement and a thorough understanding of grade-level essential knowledge and skills. The majority of the students who were not economically disadvantaged successfully passed the TAKS exam in order to have a high average scale score. Students in the free-lunch subgroup had the lowest performance of the three SES subgroups, with means ranging from 2171 (standard deviation of 184.60) to 2279 (standard deviation of 193.41).

Table 9

2003 Descriptive Statistics for TAKS Reading Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1353	2623	2357.49	163.47
Free lunch	1353	2728	2202.47	184.04
Reduced-price lunch	1353	2623	2237.19	171.83

Table 10

2004 Descriptive Statistics for TAKS Reading Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1161	2651	2324.54	165.85
Free lunch	1161	2690	2186.86	178.32
Reduced-price lunch	1809	2651	2221.16	160.96

Table 11

2005 Descriptive Statistics for TAKS Reading Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1026	2729	2339.22	183.98
Free lunch	1026	2714	2171.93	184.602
Reduced-price lunch	1809	2714	2213.16	160.131

Table 12

2006 Descriptive Statistics for TAKS Reading Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1150	2813	2443.44	185.66
Free lunch	1150	2813	2279.00	193.41
Reduced-price lunch	1150	2813	2315.63	185.05

Figure 1 visually presents the mean scale scores by year. The mean scale scores decreased somewhat between 2003 and 2004 or third grade and fourth grade. Scores improved the most from 2005 to 2006 with almost 100-point increases for each subgroup. Overall, the subgroups by SES increased and decreased at approximately the same amounts each year.

Figure 1. TAKS reading mean scale scores by SES from 2003 to 2006.

As shown in Table 13, the variances in mean scale scores from year to year were minimal. If the data were viewed as a cross section of time, an achievement gap existed when students who were not economically disadvantaged scored higher than students receiving free lunch. Almost 150-point gaps were shown every year between the two groups. In 2003, the difference was 155.02. Respectively, 2004, 2005, and 2006 had differences of 137.68, 167.29, and 164.44. Differences were calculated by subtracting the subgroups mean score *(M_2)* from the other subgroup's mean score *(M_1).*

Likewise, differences were found each year between the achievement levels of students who received a reduced-price lunch and students who were not economically disadvantaged. For the years 2003, 2004, 2005, and 2006, the differences were 120.30, 103.38, 126.06, and 127.81 respectively. Students receiving free lunches scored approximately 35 points lower each year than those receiving reduced-price lunches. Differences for 2003 were 34.72, for 2004 were 34.30, for 2005 were 41.24, and for 2006 were 36.63.

Effect sizes were calculated using Cohen's *d*. Cohen's *d* effect sizes are the differences between the means, $M_1 - M_2$, divided by standard deviation of either group (Cohen, 1988). In this case, the effect sizes measured the standardized difference between the mean scale scores on TAKS reading. A Cohen's *d* effect size was small if it equaled 0.2. A medium effect size was 0.5, and a large effect size was 0.8 (Cohen, 1988). Cohen's *d* effect sizes were large for not economically disadvantaged students compared to students receiving free lunches. Effect sizes were 0.8906, 0.7996, 0.9077, and 0.8674 for 2003, 2004, 2005, and 2006 respectively. This meant a clear variation in achievement existed between students receiving free lunches and students not economically disadvantaged. Effect sizes of 0.6757, 0.6086, 0.7295, and 0.6753 remained moderate for students not economically disadvantaged compared to students receiving reduced-price lunches. The smallest effect sizes (0.2858, 0.3014, 0.3641, and 0.2799) were found when comparing students receiving reduced-price lunches and free lunches.

Table 13

Scale Score Differences (M_1-M_2) and Effect Sizes (d) for TAKS Reading

	2003		2004		2005		2006	
	M_1-M_2	*d*	M_1-M_2	*d*	M_1-M_2	*d*	M_1-M_2	*d*
Not economically disadvantaged vs. Free lunch	155.02	.8906	137.68	.7996	167.29	.9077	164.44	.8674
Not economically disadvantaged vs. Reduced-price lunch	120.30	.6757	103.38	.6086	126.06	.7295	127.81	.6753
Reduced-price lunch vs. Free lunch	34.72	.2858	34.30	.3014	41.23	.3641	36.63	.2799

Reading Correlations

Pearson product correlational statistics were calculated among district, ethnicity, gender, SES from 2003 to 2006, and TAKS reading scale scores from 2003 to 2006. The results are presented in Table 14. Overall, the correlation coefficients among reading achievement scores calculated for the subgroups of students, formed on the basis of SES, were consistent. Most correlations were statistically significant based on a 0.01 alpha level.

Statistically significant correlations ranged from r= 0.067 to r= 0.779 (with p= 0.01) with the strongest correlation for 2004 SES and 2005 SES of r = 0.779 with p= 0.01. Thus, the SES levels of students remained stable across time. Few students changed their status from free, reduced-price, or not economically disadvantaged. Correlations between SES and TAKS reading scores had low negative correlations. The 2003 SES and 2003 TAKS were statistically significant at the 0.01 level with r= -0.327. Similar correlations were found for 2004, 2005, and 2006 TAKS and SES (r= -0.294, r= -0.330, and r= -0.314 respectively). As SES levels increased, the TAKS reading scores increased as well.

HLM Analysis

Merely examining the descriptive statistics was not sufficient due to the nested structure of the data. Thus, HLM was used to determine whether differences existed in student subgroup academic growth rates. HLM enabled the researcher to more easily parse the variance that occurred within the TAKS test scores, mostly tied to the student characteristics; the variance between students, mostly tied to the SES; and the variance between school districts, mostly tied to district characteristics of the students as a

Table 14

Correlations for District, Ethnicity, Gender, 2003 to 2006 SES, and TAKS Reading Scale Scores from 2003 to 2006 (n=9746)

	1	2	3	4	5	6	7	8	9	10	11
District (1)	1.000										
Ethnicity (2)	.110**	1.000									
Gender (3)	-.018	.001	1.000								
2003 SES (4)	-.290**	-.222**	.004	1.000							
2003 Reading Score (5)	.202**	.167**	.071**	-.327**	1.000						
2004 SES (6)	-.307**	-.227**	-.001	.776**	-.323**	1.000					
2004 Reading Score (7)	.136**	.131**	.067**	-.292**	.664**	-.294**	1.000				
2005 SES (8)	-.293**	-.226**	.001	.750**	-.327**	.779**	-.290**	1.000			
2005 Reading Score (9)	.222**	.132**	.034**	-.323**	.652**	-.323**	.694**	-.330**	1.000		
2006 SES (10)	-.295**	-.217**	-.001	.716**	-.312**	.727**	-.283**	.781**	-.320**	1.000	
2006 Reading Score (11)	.198**	.131**	.082**	-.314**	.592**	-.308**	.625**	-.309**	.658**	-.314**	1.000

** Correlation is significant at the .01 level (2-tailed).

whole. The variation at each of the levels, as could be observed in the models, was due to the randomness or error.

Variance Components

Table 15 displays restricted maximum likelihood estimates of the variance components. In this case, with the nested model and the same fixed effects, the restricted maximum likelihood produced similar results as full maximum likelihood. Thus, restricted maximum likelihood estimates were used. At the student level, variance (σ^2) was 16,043.56. At the district level, τ_{00} was the variance of the true district means, π_0, around the grand mean, β_{00}. The estimated variability in these district means was 22,936.12.

To gauge the magnitude of the variation among districts in their mean achievement levels, it was useful to calculate the plausible values range for these means. Under the normality assumptions of $\pi_0 = \beta_{00} + r_0$, 95% of the district means would be expected to fall within the range:

$$\beta_{00} \pm 1.96(\tau_{00})^{1/2} = 2336.34 \pm 1.96(22936.12)^{1/2} = (2039.49, 2633.17)$$

Confidence intervals determine the reliability of estimates. This indicated a substantial range in average scale scores among districts in this sample data.

The intraclass correlation (ICC), which represented the proportion of variance in Y among districts, was estimated by substituting the estimated variance components for their respective parameters. Data were inputted into the following equation

$$\rho = \tau_{00} / (\tau_{00} + \sigma^2) = 22936.12 / (22936.12 + 16043.56) = 0.59$$

This indicated that 59% of the variance in reading achievement was among districts.

Table 15

HLM Reading Results

Fixed Effect		*Coefficient*	*se*	
Average district mean, y_{00}		2336.34	20.85	

Random Effect	*Variance Component*	*df*	*χ2*	*p Value*
District mean	22936.12	3906.00	26325.86	< .01
Level-1 effect, *r*	16043.56			

With this information, a level-3 model was needed to determine the reason for the variation between the districts which was level-3.

HLM Reading Results

Each SES subgroup's distribution of reading achievement was characterized by two parameters- the intercept and the slope. The intercept was the mean starting point of the line for each group of students (free lunch, reduced-price lunch, and not economically disadvantaged). The reading intercept for this study was 2399.391. The Texas Education Agency (TEA), the governing body for the TAKS test, set the passing rate at 2100, and, thus, 2399.391was considerably higher. In fact, the commended standard, which indicated that students mastered the grade level skills, was set at 2400. In short, a minimal difference existed between the initial reading intercept and the commended standard.

Analysis of student gender found females scored 11.660 points higher than males. This amount was minute. Likewise, ethnicity was not statistically significant with a t-ratio of 2.386. The t-ratio showed the intercept of the average reading scale scores were equal across the ethnicities. This indicated that the intercepts were similar across the ethnicities.

School district SES was statistically significant in relation to reading achievement (see Table 16.) A coefficient of -4.23 showed the students who received reduced-price lunches scored 4.23 scale score points less than those who were not economically disadvantaged. Students receiving free lunch scored an additional 4.23 scale score points less. District SES was statistically significant at the 0.01 level with a t-ratio of -3.592, but student SES was not statistically significant with a t-ratio of 0.018.

Student SES yielded a coefficient of 0.408, which meant students who received free lunch scored 0.408 points lower than students receiving reduced-price lunches and 0.816 points fewer compared to not economically disadvantaged students. The slope described the growth rate of a group over time. The reading results showed all subgroups, based on SES, increased in achievement at the same rate.

When time is squared, acceleration is found. Achievement rates in reading accelerated slowly over time. Each year 29.891 points were gained in reading scale scores. Thus, based on the ICC, other variables might have caused the variability among the school districts. SES, ethnicity, and gender did not account for the differences.

Table 16

HLM Three-Level Analysis of TAKS Reading Data

Fixed Effect	Coefficient	Standard Error	T-ratio
Model for initial reading score, P_0			
Model for mean initial status of average student B_{00}			
Intercept, G_{000}	2399.391	74.930	32.022*
Student ethnicity, G_{010}	-2.678	11.326	-.236
Student gender, G_{020}	11.660	4.886	2.386*
District SES, G_{031}	-4.23	1.178	-3.592*
Student SES, G_{030}	.408	22.075	.018
Model for learning rate, P_1			
Model for learning rate of average student, B_{10}			
Intercept, G_{100}	-126.488	6.887	-18.366*
Model for acceleration of learning rate, P_2			
Model for acceleration of learning rate of average student, B_{20}			
Intercept, G_{200}	29.891	1.356	22.046*

* Significant at the 0.01 level.

As stated in the limitations, this study included only five school districts. Although there were only five clusters rather than the recommended 25 to 30 clusters, this did not affect the standard error because of the large number of participants in the study (Raudenbush, 2002).

While statistical significance was found in the intercept, student ethnicity, student gender, and district SES, the coefficients were very small and exhibited little variance among the subgroups. The coefficients showed differences from the intercept for each group analyzed. For example, the largest coefficient was in gender with 11.66 scale score points. This meant the females scored 11.66 scale score points higher than the males. For the TAKS, this was a small amount of points when the range went from 1000 to 3200 (TEA, 2006a).

Reading Results Summary

Students who were low SES began the third grade behind students who were not economically disadvantaged. As shown in Table 9, the not economically disadvantaged group obtained a mean scale score of 2357.49, while the students receiving reduced-price lunches scored an average of 2237.19. The lowest scoring students were those receiving free lunch with a mean scale score of 2202.47. From Table 12, the scale scores for 2006 were seen for the same groups of students. Students who were not economically disadvantaged had a mean scale score of 2443.44. Students receiving reduced-price lunches achieved an average scale score of 2315.63, and again the lowest scoring group was the students receiving free lunch, with a mean scale score of 2279.00.

Differences and effect sizes for each year of the study were calculated. Not economically disadvantaged students, when compared to students receiving free lunch, have scale score differences of 155, 138, 167, and 164 scale score points for 2003, 2004, 2005, and 2006 respectively. The differences in scale score points for students not economically disadvantaged and students receiving reduced-lunch prices were 120 for 2003, 103 for 2004, 126 for 2005, and 128 for 2006. Thus, low-SES students, especially students receiving free lunches, continued to lag in achievement each year and did not close the gap between them and the not economically disadvantaged students. Cohen’s *d* effect sizes were the largest for students who were not economically disadvantaged as compared to students receiving free lunches. For this group, the effect sizes were 0.8906 for 2003, 0.7996 for 2004, 0.9077 for 2005, and 0.8674 for 2006. These strong effect sizes meant differences were practically significant.

From the HLM results, statistical significance was found at the intercept for student ethnicity, student gender, and district SES. However, the coefficients showed small differences in the scale scores. Starting at 2399.39, the differences for each variable were less than 15 points between subgroups. On TAKS, scale scores of 15 points is minimal (TEA, 2006a).

Mathematics

Descriptive Statistics

The TAKS mathematics data set included 9,879 participants. The majority of the students in the data set for mathematics were the same students as those who took the TAKS reading. As in the reading results, the not economically disadvantaged group of students constituted the greatest number of students with 6,969 (70.5%). The free-lunch students had the second largest number of students with 2,335 (23.6%), and the reduced-price lunch group had the least number of students at 575 (5.8%).

Tables 17, 18, 19, and 20 show the minimum scale scores, maximum scale scores, mean scale scores, and standard deviations for 2003, 2004, 2005, and 2006. The 2003 SES level was used for each year to categorize the students as not economically disadvantaged, receiving free lunches, and receiving reduced lunches. The not economically disadvantaged students scored the highest mean scale score with 2316.70 in 2003 with a standard deviation of 177.50. For 2003, the students receiving reduced-price lunches achieved a mean scale score of 2226.06 with a standard deviation of 159.66, and the students receiving free lunch scored 2183.57 points with a standard deviation of 186.18. Scale scores for all subgroups continued to increase in 2004 and again in 2005. In 2006, the scores dropped slightly, possibly due to the more difficult information included in the sixth-grade TAKS exam. The 2006 mean scale score for not economically disadvantaged students was 2393.66 with a standard deviation of 222.41. For students receiving reduced-price lunches, the mean scale score was 2256.78 in 2006 with a standard deviation of 206.59. Finally, students who received free lunch prices scored the lowest, with 2220.69 scale score points and a standard deviation of 209.02.

Table 17

2003 Descriptive Statistics for TAKS Mathematics Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1207	2728	2316.70	177.501
Free lunch	1207	2728	2183.57	186.18
Reduced-price lunch	1721	2727	2226.06	159.66

Table 18

2004 Descriptive Statistics for TAKS Mathematics Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	909	2699	2335.96	176.38
Free lunch	909	2936	2209.87	197.76
Reduced-price lunch	909	2699	2248.25	183.88

Table 19

2005 Descriptive Statistics for TAKS Mathematics Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1068	2823	2404.32	218.43
Free lunch	1068	2823	2239.29	211.03
Reduced-price lunch	1068	2823	2283.69	202.908

Table 20

2006 Descriptive Statistics for TAKS Mathematics Scale Scores by SES

SES (2003)	Minimum	Maximum	Mean	SD
Not economically disadvantaged	1720	2876	2393.66	222.41
Free lunch	926	2876	2220.69	209.02
Reduced-price lunch	1066	2876	2256.78	206.59

Figure 2 depicts a different picture than Figure 1. Figure 2 indicates that the students improved each year until 2006, or sixth grade. In the sixth grade, scores decreased slightly. The difference in scale scores widened slightly in 2004 to 2005 between not economically disadvantaged students and students receiving reduced-price and free lunches, which created gaps of 165 points. The largest variance in scale scores was between the students receiving free lunches and those that were not economically disadvantaged (172.97 points in 2006).

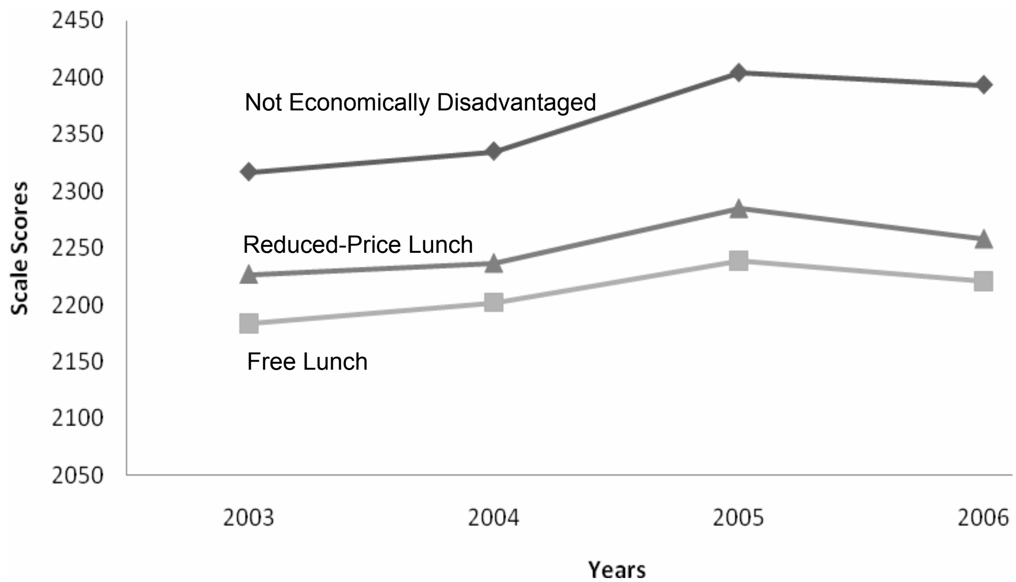

Figure 2. TAKS mathematics mean scale scores by SES from 2003 to 2006

The differences in scale scores among the three subgroups of SES increased somewhat each year. Differences were calculated by subtracting the subgroup's mean score (M_2) from the other subgroup's mean score (M_1). On Table 21, the differences in mean scale scores between students who were not economically disadvantaged and those receiving free lunch went from 133 points in 2003 to 126 points in 2004. In 2005, a 40 point increase in the gap made the difference 164 points. Last, in 2006, the difference was 173 points. The differences showed a considerable gap between the not economically disadvantaged students and students receiving free lunches. Differences between not economically disadvantaged students and students receiving reduced-lunch prices were smaller with 91 points in 2003, 88 points in 2004, 121 points in 2005, and 137 points in 2006. The smallest differences were found between students receiving reduced-price lunches and students receiving free lunches. The difference in 2003 was 42 points. Similarly, for 2004 the difference was 38 points. Slightly more was the difference in 2005 of 44 points, and 2006 had a difference of 36 points.

Effect sizes were the strongest for not economically disadvantaged students when compared to students receiving free lunch with *d*=0.8015 (see Table 21.) When *d* equals greater than 0.7, a large effect is found (Cohen, 1988). The effect sizes for students who were not economically disadvantaged as compared to students receiving free lunch were almost all greater than 0.7, which meant they were moderate effect sizes (Cohen, 1988). For 2003, the effect size between not economically disadvantaged students and students receiving free lunch was 0.7319. For 2004, the effect size for the same group was 0.6729 (which was slightly lower than the previous year). In 2005, the effect size increased, with *d*= 0.7684. The strongest effect size was found in 2006 between the students who were not economically disadvantaged and students receiving free lunch, with *d*= 0.8015.

Table 21

Scale Scores Differences and Effect Sizes in Mathematics

	2003		2004		2005		2006	
	M_1-M_2	*d*	M_1-M_2	*d*	M_1-M_2	*d*	M_1-M_2	*d*
Not economically disadvantaged vs. Free lunch	133.13	.7319	126.09	.6729	165.03	.7684	172.97	.8015
Not economically disadvantaged vs. Reduced-price lunch	90.64	.5226	87.71	.4593	120.63	.5827	136.88	.6587
Reduced-price lunch vs. Free lunch	42.49	.3764	38.38	.2952	44.40	.3095	36.09	.2471

Mathematics Correlations

Table 22 presents the Pearson product correlational statistics calculated among district, gender, ethnicity, 2003 to 2006 SES, and 2003 to 2006 TAKS mathematics scores. Most correlation coefficients were statistically significant at the 0.01 level. Small negative correlations were found between 2003 SES and 2003 TAKS mathematics scores (r= -0.263 for p= 0.01), between 2004 SES and 2004 TAKS (r= -0.244 for p= 0.01), between 2005 SES and 2005 TAKS (r= -0.289 for p= 0.01), and between 2006 SES and 2006 TAKS (r= -0.290 for p= 0.01). These results showed that as SES decreased, TAKS scores decreased. At the 0.05 level, the correlation between 2006 TAKS mathematics scores and gender were statistically significant (r = -0.021 for p= 0.01). The correlations ranged from r= -0.001 for 2006 SES and gender to r= 0.789 for 2006 SES and 2005 SES. Little relationship was found between the SES and gender overall. The other correlations to gender and 2003, 2004, or 2005 were not statistically significant either. The strongest correlated variables were among the SES groups for the different years. The correlation coefficient for 2006 SES and 2005 SES was r= 0.789 (p= 0.01). This strong correlation showed the SES of students remained the same from year to year.

Statistical significance was found in the relationships between SES and TAKS scale scores. For 2003 TAKS and 2003 SES, the correlation was r= -0.263 for p= 0.01. Similar strength of statistical significance was found in the correlations between 2004 TAKS and 2004 SES (r= -0.244 for p= 0.01), 2005 TAKS and 2005 SES (r= -0.28 for p= 0.01), and 2006 TAKS and 2006 SES (r= -0.290 for p= 0.01).

Table 22

Correlations for District, Gender, Ethnicity, 2003 to 2006 SES, and 2003 to 2006 TAKS Mathematics Scale Scores (n= 9,879)

	1	2	3	4	5	6	7	8	9	10	11
District (1)	1.000										
Gender (2)	-.018	1.000									
Ethnicity (3)	.105**	.003	1.000								
2003 SES (4)	-.276**	.003	-.222**	1.000							
2003 Mathematics Score (5)	.164**	-.083**	.089**	-.263**	1.000						
2004 SES (6)	-.290**	-.003	-.226**	.777**	-.275**	1.000					
2004 Mathematics Score (7)	.132**	-.040**	.061**	-.243**	.582**	-.244**	1.000				
2005 SES (8)	-.276**	.003	-.225**	.751**	-.276**	.781**	-.255**	1.000			
2005 Mathematics Score (9)	.188**	-.047**	.069**	-.275**	.654**	-.284**	.618**	-.289**	1.000		
2006 SES (10)	-.286**	-.001	-.216**	.727**	-.266**	.734**	-.243**	.789**	-.277**	1.000	
2006 Mathematics Score (11)	.192**	-.021*	.032**	-.291**	.632**	-.291**	.597**	-.298**	.731**	-.290**	1.000

* Correlation is significant at the .05 level (2-tailed).
** Correlation is significant at the .01 level (2-tailed).

HLM Analysis

Descriptive statistics presented only one facet of the information to be gleaned from the data. HLM separated information out by variables to determine if differences in academic growth existed among the three SES subgroups. The variances between the SES subgroups were revealed with the HLM output.

Variance Components

Table 23 listed restricted maximum likelihood estimates of the variance components. At the student level, variance (σ^2) was 7,935.10. At the district level, τ_{00} was the variance of the true district means, π_0, around the grand mean, β_{00}. The estimated variability in these school means was 2,262.83.

To measure the magnitude of the variation among schools in their mean achievement levels, it was useful to calculate the plausible values range for these means. Under the normality assumptions of $\pi_0 = \beta_{00} + r_0$, 95% of the school means would be expected to fall within the range:

$$\beta_{00} \pm 1.96(\sigma^2)^{1/2} = 2262.83 \pm 1.96(7935.10)^{1/2} = (2437.43, 2088.23)$$

The formula determined a substantial range in average scale scores among districts in this sample data.

The intraclass correlation (ICC), which represented the proportion of variance in Y among districts, was estimated by substituting the estimated variance components for their respective parameters in the following equation:

$$\rho = \tau_{00} / (\tau_{00} + \sigma^2) = 19{,}706.32 / (19{,}706.32 + 7935.10) = 0.71$$

This revealed that 71% of the variance in mathematics achievement was among districts. The large variance showed the need for further investigation into the differences in achievement. By adding in district level variables, variances may be parsed out. Thus, a level-3 model was created.

Table 23

HLM Mathematics Results

Fixed Effect		*Coefficient*	*se*	
Average district mean, y_{00}		2262.83	7.05	
Random Effect	*Variance Component*	*df*	*χ2*	*p Value*
District mean	19706.32	326.00	421.12	< .01
Level-1 effect, *r*	7935.10			

HLM Mathematics Results

The results from HLM showed academic growth on TAKS were similar for all SES subgroups. TAKS results are reported as scale scores. Scale scores compare scores with the standards and take into consideration the differences in the difficulty of the test variations for each administration. The average scale score for all students in mathematics was 2442.070. This exceeded the commended rate of 2400.

Ethnicity made a negligible difference (increase of 0.355 each year) on the academic growth of students. Student ethnicity, student SES and district SES were not statistically significant. However, the t-ratio for gender was -5.098, which was statistically significant at the 0.01 level. Males grew slightly faster than females with an increase of 23.912 points on their scale scores each year.

When time was squared, the acceleration for reading increased by 29.891 points per year, but for mathematics the acceleration decreased by 5.976 points per year. This meant that reading achievement progressed faster than mathematics achievement. In other words, the achievement in reading increased at a faster rate per year than the achievement for mathematics. Thus, reading achievement should be better than mathematics achievement for each year. However, in some years it was not; mathematics achievement was greater than reading achievement in 2004 and 2005.

Table 24

HLM Three-Level Analysis of Mathematics Data

Fixed Effect	Coefficient	Standard Error	T-ratio
Model for initial reading score, P_0			
Model for mean initial status of average student B_{00}			
Intercept, G_{000}	2442.070	53.181	45.920*
Student ethnicity, G_{010}	.355	4.904	.072
Student gender, G_{020}	-23.912	4.691	-5.098*
District SES, G_{031}	.144	4.666	.031
Student SES, G_{030}	-124.576	79.555	-1.566
Model for learning rate, P_1			
Model for learning rate of average student, B_{10}			
Intercept, G_{100}	-5.976	4.487	-1.332
Model for acceleration of learning rate, P_2			
Model for acceleration of learning rate of average student, B_{20}			
Intercept, G_{200}	-5.604	.883	-6.344*

* Significant at the 0.01 level.

Mathematics Results Summary

By analyzing a cross section of the data, students in the three SES subgroups varied in achievement each year. As shown in Tables 17, 18, 19, and 20, not economically disadvantaged students scored the highest mean scale scores (2316 for 2003, 2336 for 2004, 2404 for 2005, and 2394 for 2006), followed by students receiving reduced-lunch prices (2226 for 2003, 2248 for 2004, 2284 for 2005, and 2257 for 2006), and finally students receiving free lunches (2183 for 2003, 2210 for 2004, 2239 for 2005, and 2221 for 2006).

Finding effect sizes showed the magnitude of SES on student achievement. Strong effect sizes (Cohen, 1988) were found between students who were not economically disadvantaged and students receiving free lunch. In 2003, the Cohen's *d* effect size was 0.7319. The 2004 Cohen's *d* effect size was 0.6729, which was slightly less than the previous year. The 2005 Cohen's *d* effect size increased again to 0.7684. Last, the effect size increased even more in 2006 to 0.8015.

In terms of achievement growth rates, each SES subgroup increased in achievement each year at approximately the same rate. Thus, students receiving free lunches gained the same amount as students receiving reduced-lunches prices and students who were high SES.

Summary by Research Questions

To answer the six research questions, statistical procedures were applied. First, descriptive statistics, including percentages, means, standard deviations, and correlations, were calculated. Correlational statistics for district, ethnicity, gender, SES from 2003 to 2006, and TAKS scores from 2003 to 2006 were computed. Additionally, mean comparisons, along with the Cohen's effect sizes (*d*), of SES for 2003 to 2006 were calculated. Furthermore, 3-leveled HLM analyses were conducted.

Question 1 focused on differences in reading growth rates between students who were not economically disadvantaged and those who received free lunches. Differences in scores and effect sizes are presented in Table 13. The analysis indicated differences existed in the reading achievement among children grouped by SES when comparing scores each year. Not economically disadvantaged students outperformed students receiving free lunches. The difference in achievement changed slightly each year. In 2003, the difference between not economically disadvantaged students and students receiving free lunches was 155.02 scale score points. The differences decreased in 2004 (137.68) but rose again in 2005 (167.29), and then decreased in 2006 (164.44). The effect sizes from 2003 to 2006, respectively 0.8906, 0.7996, 0.9077, and 0.8674, were strong when comparing the not economically disadvantaged students and the students receiving free lunches across the years. The HLM results did not show strong differences in growth among the student groups. The t-ratio equaled 0.018, which was not statistically significant. Increases each year were consistent between the not economically disadvantaged students and the students receiving free lunches; thus, no statistical significance was found in the growth rate of children due to SES. Students advanced at similar rates.

Answering Question 2 required analysis of growth models for students who received reduced-price lunches and those who were not economically disadvantaged. Students receiving reduced-price lunches scored over 100 points lower than students receiving no lunch discounts. The effect sizes were very similar each year and indicated moderate effect sizes: 0.6757 for 2003, 0.6086 for 2004, 0.7295 for 2005, and 0.6753 for 2006 (see Table 13). Again, the HLM results show negligible differences in the growth rates of students who were not economically disadvantaged and those who received reduced-price lunches. When looking at a cross section of time each year, 100-point differences existed; however, little variance occurred in the rate of growth for students in the reduced-price lunch subgroup when compared to the students not economically disadvantaged.

Question 3 analyzed differences in reading growth between students who received free lunches and students who received reduced-price lunches. The smallest difference in scores was found between these two groups of students. Thus, the small effect sizes (Cohen, 1988) were 0.2858 for 2003, 0.3014 for 2004, 0.3641 for 2005, and 0.2799 for 2006. These effect sizes and HLM results show very little difference in the rate of growth between students receiving free and reduced-price lunches. The groups of students that received lunch discounts, free or reduced prices, were close in scores and increased at approximately the same rates.

Questions 4, 5, and 6 addressed differences in mathematics achievement over a four-year period from Grades 3 to 6. Table 21 displays the differences in scale scores and effect sizes. In addition, HLM results were used to answer research Questions 4, 5, and 6.

Question 4 sought to determine if a statistically significant difference in academic growth existed on the Texas Assessment of Knowledge and Skills mathematics test between students who received free lunches and those who were not economically disadvantaged. Table 22 displays statistically significant correlations between SES and mathematics scores. Tables 17, 18, 19 and 20 present a comparison of students who were not economically disadvantaged versus students who received free lunches. The difference in 2003 was 133 points and rose to 172 points in 2006. The effect sizes each year were moderate to high. The differences increased each year from 2003 to 2006, with a 133.13-point difference in 2003, 126.09 in 2004, 165.03 in 2005, and 172.97 in

2006. The comparison of yearly scores for students who were not economically disadvantaged and those students receiving free lunches showed no statistical significance. HLM results for the rate of growth showed no statistical significance with a t-ratio of -1.566.

Question 5 addressed differences in the growth trajectories on the TAKS mathematics for students who received reduced-price lunches as compared to those who did not receive discounts. Similar to the reading results, the students receiving no lunch discounts (not economically disadvantaged) and students receiving reduced-price lunches had approximately a 100-point difference on TAKS mathematics scale scores. The effect sizes were moderate, around 0.50 each year. For 2003, the effect size was 0.5226, 2004 was 0.4593, 2005 was 0.5827, and 2006 was 0.6587. The HLM results showed students not economically disadvantaged and those receiving reduced-price lunches grew at approximately the same rate. Thus, while a gap existed in the cross section analysis of achievement, the growth rate did not vary over the four years of the study.

Question 6 focused on the differences in mathematics growth for students who received reduced-price lunches and students who received free lunches. In the third grade in 2003, students who received reduced-price lunches had a mean scale score of 2226.06 with a standard deviation of 159.66. In sixth grade (2006), the students receiving reduced-price lunches reached a mean scale score of 2256.78 with a standard deviation of 206.59. In 2003, students receiving free lunches started with a mean scale score of 2183.57 (standard deviation of 186.18) and increased, by 2006, to 2220.69 (standard deviation of 209.02). The differences remained approximately the same each year. The low-SES subgroups (students receiving free lunches and reduced-price lunches) did not show a statistically significant difference in achievement nor in the rate of growth. The small effect sizes, as well as the HLM analyses, did not impact the achievement differences between students receiving reduced-price lunches and free lunches.

Summary

In this chapter, results of the statistical procedures were reported. Results were separated into two main sections for reading and mathematics. Each subject area section contained descriptive statistics, which include maximum, minimum, mean, and standard deviations on the TAKS scale scores, as well as correlations. HLM analyses followed the descriptive statistics.

Research questions were answered. For reading, results showed little variance in the rate of growth among the subgroups of students receiving free lunches, students receiving reduced-price lunches, and students not economically disadvantaged. However, gaps in achievement existed among the three SES subgroups. Students who were not economically disadvantaged scored the highest on the TAKS, followed by students receiving reduced-price lunches. Students receiving free lunches scored the lowest of all students on the TAKS reading exam.

In regards to mathematics achievement, students not economically disadvantaged showed differences in achievement when compared to students receiving free lunches. However, when comparing students not economically disadvantaged and students receiving reduced-price lunches, less difference existed. Likewise, the least difference was found between the achievement and growth rates of students receiving reduced-price lunches and students receiving free lunches. Students who are not economically disadvantaged had a higher mean scale score than those who receive free or reduced-price lunches. But the rate of growth for all subgroups was about the same. Thus, students who receive free or reduced-price lunches were learning at the same rate but not learning the same information because they were instructed on a more primary level.

The six research questions resulted in no differences in growth rates of students who were not economically disadvantaged, students receiving reduced-price lunches, and students receiving free lunches. Chapter V will discuss findings, conclusions, and recommendations based on the results from this chapter.

CHAPTER V

FINDINGS, CONCLUSIONS, RECOMMENDATIONS, AND SUMMARY

The purpose of this study was to examine the differences in growth rate over four years among students who vary in socioeconomic status (SES), based on those who receive free lunches, those who receive reduced-price lunches, and those not economically disadvantaged. Previous studies have not examined these three SES categories nor have they analyzed data longitudinally. Paris (2003) examined one school of 656 students for the 2000-2001 school year. Sorhaindo (2003) analyzed data for only the 1998 year. Decisions should not be made with solely one year's results. Changes over time are important to determine if achievement gaps are narrowing or widening. If gaps are growing, then schools may not be effective and efficient in educating children. Issues can only be identified if data are tracked over time.

Also, the majority of past studies (Higgins, 2006; Mulvenon et al., 2001; Carmichael, 2004) only compared the students who were economically disadvantaged versus not economically disadvantaged. This study includes almost 10,000 participants from five school districts in Texas and analyzes their achievement on the Texas Assessment of Knowledge and Skills (TAKS) reading and mathematics from 2003 to 2006. The researcher goes one step further and differentiates the achievement growth rate of economically disadvantaged students by separating the students receiving free lunches from the students receiving reduced-price lunches. The more specific identification of the SES subgroup is critical since students receiving free lunches comprise almost 25% of the participants while students receiving reduced-price lunches are only 5% of the participants. A much larger portion of students qualified for free lunch, which means the majority of the students who are low SES had an income level below $18,400 in 2003. The students receiving free lunches also score the lowest on the TAKS. Educators should ensure that interventions are provided to students who are the furthest behind academically which, in many cases, are the students receiving free lunches.

The following research questions guided the study:

1. Over a four-year period from Grades 3 to 6, does a difference in the rate of growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?
2. Over a four-year period from Grades 3 to 6, does a difference in the rate of growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
3. Over a four-year period from Grades 3 to 6, does a difference in the rate of growth exist on the Texas Assessment of Knowledge and Skills reading test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?
4. Over a four-year period from Grades 3 to 6, does a difference in the rate of growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received free lunches?

5. Over a four-year period from Grades 3 to 6, does a difference in the rate of growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who were not economically disadvantaged and students who received reduced-price lunches?
6. Over a four-year period from Grades 3 to 6, does a difference in the rate of growth exist on the Texas Assessment of Knowledge and Skills mathematics test between students in selected major suburban school districts who received reduced-price lunches and students who received free lunches?

Findings

The results of the analyses support several findings. All subgroups of students appear to be doing well in reading and mathematics. On the 2003 TAKS reading exam, the mean scale scores in 2003 for students who were not economically disadvantaged was 2357.49, or only about 50 points away from a commended score of 2400 (meaning students had a thorough understanding of grade-level essential knowledge and skills). The students receiving a reduced-price lunch scored slightly lower with a mean of 2237.19 on the 2003 TAKS reading exam. The lowest scoring subgroup was the students receiving free lunch, with a mean scale score of 2202.47. The passing standard was 2100 in 2003. On average, even the students in the lowest SES subgroup passed the TAKS exam. Similar mean scale scores were achieved on the TAKS reading test in 2004, 2005, and 2006. In contrast, on the NAEP (the national assessment) 16% of low-SES children fell in the Proficient level in reading as compared to 39% of middle- or high-SES children (Rocha & Sharkey, 2005). So while students appear to be successful on the Texas state assessments, when compared to the national assessment, their achievement does not show to be as high. Texas fourth-grade students ranked number 38 out of 50 states in reading on the NAEP (Rocha & Sharkey, 2005). With the scores on the TAKS exam, Texas ought to rank much higher when compared to the rest of the 50 states.

In mathematics, the mean scale score in 2003 for students who were not economically disadvantaged was 2316.70. Again, this is quite close to the commended standard of 2400. For students who received reduced-price lunch, the mean scale score was 2226.06. Those students receiving free lunches scored an average of 2183.57 scale score points. The students in the lowest subgroup still averaged out to be higher than the passing rate of 2100. Very similar results occurred in 2004, 2005, and 2006. Texas fourth-grade students ranked 24 out of 50 in mathematics on the NAEP scores (Rocha & Sharkey, 2005). Twenty-fourth place means Texas ranks just slightly better than half of the states. This is not reflected in the mean scale scores of students.

Cross-sectional analysis shows differences are present among students who are not economically disadvantaged, who receive reduced-price lunches, and who receive free lunches. In 2003, a 155-point scale score difference is found between students who are not economically disadvantaged and students receiving free lunches and shows a large effect size of 0.8906. For the same year, a 120-point difference is found between students not economically disadvantaged and students receiving reduced-price lunches. This yields a medium effect size of 0.6757. The smallest difference (35 points) is found between students receiving reduced-price lunches and students receiving free lunches and is a small effect size of 0.2858. These results reflect the same findings of past research by Paris (2003) and Sorhaindo (2003) that also used the same three categories of students as designated by the National School Lunch Program.

For 2004, 2005 and 2006, the differences in scale scores among the SES levels are similar. In reading, differences between not economically disadvantaged students and students receiving free lunches have large effect sizes. For 2004, 2005, and 2006, the effect sizes were 0.7996, 0.9077, and 0.8674. Differences between not economically disadvantaged students and students receiving reduced-price lunches have medium effect sizes of 0.6086, 0.7295, and 0.6753 for 2004, 2005, and 2006, respectively. Finally, small effect sizes for differences between students receiving reduced-price lunches and students receiving free lunches are 0.314, 0.3641, and 0.2799 for 2004, 2005, and 2006, respectively. The mathematics effect sizes reflect the same results. Large effect sizes are present between not economically disadvantaged students and students receiving free lunches. The effect sizes between these groups are 0.7319 for 2003, 0.6729 for 2004, 0.7684 for 2005, and 0.8015 for 2006. Achievement between not economically disadvantaged students and students receiving reduced-price lunches has medium effect sizes of 0.5226 for 2003, 0.4593 for 2004, 0.5827 for 2005, and 0.6587 for 2006. The smallest effect sizes are between students receiving reduced-price lunches and free lunches. In 2003, the effect size is 0.3764 between students receiving reduced-price lunches and those getting free lunches. The results are similar for 2004, 2005, and 2006 with effect sizes of 0.2952, 0.3095 and 0.2471, respectively.

As shown in Table 13, the TAKS reading mean scale score differences for all SES subgroups did increase in 2005 and 2006 for Grades 5 and 6. For mathematics, the differences are larger than the differences in reading. Table 21 shows the differences among the SES subgroups for TAKS mathematics scale scores. In 2005 and 2006, the differences (165.03 and 172.97 for 2005 and 2006) between students who are not economically disadvantaged and students who received free lunches are much greater than in 2003 (133.13) and 2004 (126.09). The differences between students who are not economically disadvantaged and students receiving reduced-price lunches also increase from 2003 (133.13) and 2004 (126.09) to 2005 (120.63) and 2006 (136.88). The increase supports Carmichael's (2004) findings that student achievement gaps widen as children advance to higher grade levels. In part, this change is due to the increase in information that the students must know at the higher grade levels. Concepts in reading and mathematics also increase in difficulty. Mathematics requires basic skills to be mastered prior to advancing to higher levels and problem solving. Thus, the struggling students find it difficult to maintain their progress.

Another outcome is that the greatest differences in achievement are identified between students who are not economically disadvantaged and students who receive lunch discounts. The achievement differences between students who receive free lunches and those who receive reduced-lunch prices are minimal. The district and school funding through Title I or compensatory education for low-SES students is calculated for the number of students who qualify for free or reduced-price lunches. This funding must continue, but in order to see gains in achievement for low-SES students, different ways of using the money must be implemented. The additional supports and remediation through compensatory education and Title I help students at least maintain achievement over time (USDOE, 2001).

Comparing the mean scale scores for reading and mathematics shows that in 2003 and 2006 reading achievement is greater than mathematics achievement. Because the implementation of the Texas Reading Initiative was two years prior to the implementation of the Texas Math Initiative (Adams et al., 2007), the reading achievement should be significantly greater than the mathematics achievement. Also more time and resources have been dedicated to reading than to mathematics. But for 2004 and 2005, mathematics scale scores are greater than reading scale scores. Greater mathematics achievement is reflected in Rocha and Sharkey's 2005 study which ranked Texas fourth-grade students to be 38 out of 50 states in reading and 24 out of 50 states in mathematics. While 2004 and 2005 show greater mathematics achievement than reading achievement, 2003 and 2006 show the opposite to be true. The differences between reading and mathematics each year are 100 points or less, which is minimal because the scale ranges is approximately 2,000 points in total (TEA, 2006a). Again, this is a good example of why a longitudinal study is important. The differences each year are not reflected in a cross sectional study.

This study's focus on the longitudinal growth rate is important. Little variance in growth rates is present among the three SES groups for reading or mathematics. Each group increases or decreases in achievement at the same rate, keeping the gaps at relatively the same amounts. Several longitudinal research studies found similar findings. Lee (2006), Raudenbush (2004), and Shannon and Bylsma (2002) all analyzed sets of data and found the gap was neither narrowing nor widening.

However, the rate of growth in reading is much faster than the rate of growth in mathematics. In reading, when time was squared, student achievement increased

29.891 points per year. In contrast, the acceleration for mathematics actually decreased by 5.976 points per year. Achievement in reading is increasing at a much faster rate. Again, the most likely reason is due to the additional tutoring in reading through the Texas Reading Initiative and other Accelerated Reading programs that have been implemented throughout the state (Adams et al., 2007). During the first two years, there was tutoring in reading whereas there were no required programs for mathematics.

The variables in this study do not show any statistically significant differences in achievement rates. The variables of ethnicity and gender were included to insure that the differences in SES were not impacted by ethnicity or gender. First, ethnicity does not affect the growth rate significantly. Shannon and Bylsma found that low SES accounted for 12% to 29% of the variance in achievement while ethnicity was only 0.6% of the variance. In contrast, studies conducted by Rouse, Brooks-Gunn, and McLanahan (2005), Lee and Burkham (2002), and Education Trust (2006) all showed African-American and Hispanic students to be behind their White peers. Since these studies look only at cross sections of time their results have significance only for the years that are studied. Second, another variable that was analyzed was gender. From the HLM analysis, females scored 11.66 points higher than males in reading, and males scored 23.912 points higher than females in mathematics. These small differences did not have an impact on the study. Thus, by including ethnicity and gender, the results showed only differences from SES.

Intraclass correlations show variance among districts to be 59% for reading and 71% for mathematics. While the data set for this study did not include school level information, Opdenakker et al. (2002) found only an 18% variance among schools.

School level variances are usually larger because of the smaller numbers of students and because the neighborhood schools where students attend are more homogenous. Thus, other variables affect the achievement of students. Analyzing a child's family background by collecting data for parents' background, family structure, health care, and mobility (Hodgkinson, 2003; Educational Research Service, 2001) may identify some components of SES that make a difference. Also data on the school, such as teachers' years of experience, teachers' expectations, and amount of enrichment at the school, will lead to greater understanding of student achievement (Klein & Knitzer, 2007).

The length of a child's poverty is one factor that is not specifically analyzed in this study. However, on Table 7, the percentages of students in each SES subgroup are listed. Percentages of students each year who are not economically disadvantaged remained around 71% in reading and 70% in mathematics. About 23% of the participants in reading and 23.5% of the participants in mathematics received free lunches. The percentages of students receiving reduced-price lunches are the smallest with 5 to 7 percent in reading and 5 to 7 percent for mathematics. Most students remained in the same SES level throughout the study. Continuous poverty has a strong effect on reading and mathematics. Studies using the Peabody Individual Achievement Test (PIAT) showed students in continuous poverty scored 8.47 points lower in reading recognition and 6.75 points lower in mathematics (Smith et al., 1999). Identifying the students who are in continuous poverty will help teachers better understand the needs of children in poverty.

Conclusions

The results of this study produce several practical applications to teachers and educational leaders. While there is a gap in achievement, there is no difference in the growth rates for children who are economically disadvantaged versus those that are not. The conclusion can be drawn that children learn the same amount of information, but in actuality, economically disadvantaged children start out behind and remain behind. Low-SES students are most likely learning basic skills while not economically disadvantaged students are learning problem solving strategies and higher level thinking skills. Approximately one fourth of the TAKS reading test is analysis using critical thinking. Approximately one fifth of the TAKS mathematics test is problem solving. Fewer economically disadvantaged students receive Commended scores on their TAKS exam, most likely because they did not correctly answer the questions that required higher level thinking. A child in poverty must learn the basic information, master the higher level thinking skills, and retain the knowledge in order to close the gap.

Tutoring, after school programs, and summer school are necessary components to “catch up” a child in poverty. For example, reading remediation impacts the TAKS reading scores. When comparing the mean scale scores in reading for the SES subgroups, the gaps are smaller than the gaps in mathematics. The implementation of the Accelerated Reading Initiative two years prior to the Accelerated Math Initiative has improved the reading of students in Texas. Also setting expectations for students prior to the TAKS testing period through ARI causes teachers in the primary grade levels to be more accountable. Likewise, the nature of mathematics with skills distinctly building upon each other causes the gaps in mathematics to be large. If students do not understand the third-grade concepts, the same students will not understand the fourth-grade concepts. Lessons from high-poverty, high-achieving schools show that additional time on academics has contributed to student successes (Johnson & Asera, 1999). A critical key is for instructional leaders to allow ample time for basic core subjects such as mathematics and reading.

Funding for remediation programs for low-SES students prior to third grade should be considered. If achievement gaps exist among third-grade students grouped by SES, then interventions need to take place when children are younger. Results from this study show third-grade students from low SES are behind not economically disadvantaged students by 155 scale score points in reading and 133 scale score points in mathematics. Intensive instructional programs are needed prior to third grade to insure that gaps do not form. Programs such as Head Start and other high quality preschool programs should be more widely available for children from low-SES backgrounds. Then as children enter public school, low-achieving, low-SES students need to be identified for further remediation. Along with the identification of students, reconsideration of the funding allocations for students in grade kindergarten to second grade should be made to help support the remediation of the students in primary grade levels. Without the additional funding, support programs cannot be implemented properly.

The allocation of funding for programs such as Title I and compensatory education needs to focus on students who receive free lunches. The majority of students who are economically disadvantaged are students receiving free lunches.

Students receiving free lunches also have the lowest mean scale score on TAKS reading and mathematics. Additional or more specific funding should be given to schools and students with high percentages of students receiving free lunches. Policymakers should consider this information when restructuring programs such as Title I and compensatory education.

Studies researching student achievement should always include data over a period of time. Usage of a single year of data can lead to the wrong interpretation of results. Latent variables are not revealed through cross sectional studies.

Recommendations for Further Research

Based on the results of this study and the review of the related literature, the following recommendations for further study concerning the impact of SES on achievement are presented. Future studies should include a broader range of school districts. Only 10% of students in suburban areas attend schools with high-poverty levels (Vail, 2003). Urban area schools include more than 40% of students on free or reduced-price lunches, and 25% of students in rural areas are economically disadvantaged. Because this study only covers major suburban Texas school districts, a study for further research should investigate differences in achievement for poor students in inner city or urban school districts. Likewise, attaining data for rural school districts would likely change some of the results.

Additional studies should be conducted on the achievement of students from prekindergarten to third grade. A high percentage (58%) of four-year-olds attend Head Start in Texas. Head Start is a quality intervention to help low-income preschoolers prepare for kindergarten. However, with the numbers of prekindergarten children in

Head Start, there are still gaps between the not economically disadvantaged and children receiving discounts from the National School Lunch Program. Thus, there is a disconnect between achievement from prekindergarten to third grade when the TAKS is first administered. Studies discussed in Chapter 2 show prekindergarten increases the achievement of students. But few studies have researched first- or second- grade achievement levels and the differences between students who are economically disadvantaged and not economically disadvantaged.

Another possibility for future research concerns students in Grades 7 through 12. Students in junior high school and high school have different priorities than elementary school students, and, thus, they may have differing achievement levels. It is important to continue this study longitudinally. Data should be collected on drop out rates, graduation rates, Advanced Placement (AP) test scores, and Scholastic Aptitude Test (SAT) scores.

Intraclass correlations showed variance among districts to be 59% for reading and 71% for mathematics. The variance is not explained by the district expenditures for compensatory education. However, studies (Education Trust, 2005b; Payne & Biddle, 1999) showed that per pupil funding for schools have an effect on achievement. This study does not identify this variable to be the case. The use of other variables may need to be selected. Expenditures can be broken down into other categories such as expenditures for curriculum, teacher salaries, or classroom resources. Still other variables may need to be considered. Illinois found school climate variables accounted for about 19% and teacher beliefs about 24% of the variance in mathematics scores on the Illinois Goals Assessment Program (IGAP). Finding why there is a variance between school districts and schools would be a critical study in pinpointing the area for improvement in schools.

Finally, in the HLM reading analysis, statistical significance was found for district SES, but not for student SES. This difference in significance should be analyzed. Differences could be due to differences in teacher instruction, education leadership, curriculum, or a plethora of other variables. Further analysis using HLM with more variables and more facets of the student data will help to pinpoint the variances.

Summary

This study sought to find a difference in the growth rates of students who are not economically disadvantaged, students receiving free lunches, and students receiving reduced lunch prices. Differences in scale scores are also examined for students who are in Grade 3 in 2003, Grade 4 in 2004, Grade 5 in 2005, and Grade 6 in 2006.

Using descriptive statistics, some differences exist between students in a cross-sectional analysis. But when analyzing with hierarchical linear modeling, the growth rate differences in reading and mathematics among students that are economically disadvantaged, those receiving free lunches, and those receiving reduced-price lunches are minimal. Hence, while all students are achieving at about the same rate, students that start out behind will continue to be behind unless changes in curriculum and methods of educating children in poverty are made. Children in poverty must learn and retain more than their peers in order to close the achievement gap. Otherwise, children in poverty will never be able to achieve the same level as those who are not economically disadvantaged.

Through this study, the growth rate in achievement of children living in poverty has been identified as the same as children from wealthier backgrounds. However, children in poverty are behind academically because they start out behind children who are not economically disadvantaged. More intensive remediation programs, instruction on the higher level thinking skills, and focused allocation of Title I and compensatory education funding are necessary to help children in poverty increase achievement. Education should be preparing students for their future and providing them with the cultural capital needed to help all children be successful. With reform, educational leaders should make the changes to see all children achieve their potential.

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