ACADEMIC EXCELLENCE AND INSTRUCTIONAL EXPENDITURES IN TEXAS

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Public school per pupil costs and demands for better performance have increased over the past several decades. While the overall per pupil expenditures have increased, the percent of the educational dollar directed toward instructional activities has remained at approximately 60%. A grass-roots movement known as the "65% Solution" caught national attention by claiming that schools are not efficiently allocating resources into areas that have the greatest link to student achievement, such as instruction. Proponents of the 65% Solution claim that per pupil expenditures can be increased by shifting funds from areas considered non-instructional to areas that directly impact student instruction, such as teachers and instructional materials.

The purpose of this study was to determine the relationship between district Panel Recommended and Commended Performance TAKS Reading/ELA and Math results and three measurements of instructional expenditures, Instructional Staff Percent; TEA Instructional Expenditure Ratio; and the NCES Instructional Expenditure Ratio (65% Solution), in Texas public schools. Data was collected from the 2003-2004 AEIS report.

Multiple regression was used to conduct the analyses. In most instances, there was little, if any, relationship between TAKS Reading/ELA and TAKS Math, and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and NCES Instructional Expenditure Ratio (NIER). However, a low to moderate relationship was discovered in the comparison of TAKS Reading/ELA, and the ISP and TIER. This result

was the same for both the Panel Recommended and Commended Performance. In every instance, the ISP and TIER showed positive, statistically significant, relationships to TAKS results. The NIER, or 65% Solution, had the lowest correlation and was statistically insignificant in three out of four analyses.

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CHAPTER 1

INTRODUCTION

This study sought to discover if a relationship exists between selected district academic performance indicators and selected district instructional expenditure measures. The study is important for several reasons. The efficiency and effectiveness of public education is under constant scrutiny in an environment of increased accountability and demand for an educated workforce. The ongoing research in this area continues to yield mixed results on the impact of resources and student achievement. Developers of educational policy need to consider the relevant research in order to ensure policy intentions align with effective results.

After the Texas Legislature failed to pass new school finance legislation, Rick Perry, the Governor of Texas, issued an executive order for every school district to dedicate at least 65% of its expenditure allocations to classroom instructional activities, a program referred to as the "65% Solution" (Hoppe, 2005). Perry gave the following quote in a July 2005 edition of the *Dallas Morning News*: "The action I take today will mean more financial accountability for taxpayers, more efficiency in school spending and more money directed to the classroom so that more children achieve" (Hoppe, 2005. p. 1A).

For several decades, school finance issues have been debated at federal, state, and local levels. Numerous school finance solutions have been implemented as a result of litigation and public policy development. The focus has evolved from a simple

question of equity to a more complex concept of adequacy in an environment of higher academic accountability requirements. As educational costs continue to rise and academic performance appears stagnant, the idea of efficiency becomes the central focus of school finance policy development. In August 2004, the 250th Judicial District Court of Travis County Texas District Court determined that the Texas school finance system was unconstitutional because it had failed to adequately fund its stated goals and because the taxation system violated Texas state constitutional law (West Orange Cove, 2004). Subsequently, the 79th Texas Legislature failed to develop a politically or constitutionally acceptable school finance solution. Much of the debate was focused on school finance reform regarding the local school district's autonomy to determine spending allocations. Advocates for reform insist that allocating more resources to instructional activities and decreasing allocations to non-instructional services would improve education without the input of additional dollars. Rather than focusing on the political debates, this study concentrates on one specific outcome of these debates: the establishment of a minimum percentage of school district expenditures dedicated to instructional activities.

These factors led to the development of the research question. Does the district percentage of expenditures dedicated to instructional activities relate to the district's progress toward measurable academic performance? Will this instructional emphasis help school districts achieve higher accountability goals?

<div align="center">Research Problem</div>

Resources are required in order to adequately educate every child, but how much is adequate? Which resource allocations demonstrate the greatest control over

the variances in student achievement? Are there specific resource combinations that explain student achievement variances? What are the most effective combinations when considering district or school characteristics such as wealth, ethnicity, and socioeconomic status? These are just a few of the common inquiries that have spawned decades of education production function studies. These questions encompass far more than the scope of this study. This study focuses on the allocation of funding towards instruction and its impact on student achievement at the district level.

Public education has experienced criticism from stakeholders and policy-makers for its spending efficiency and apparent lack of academic results. Reforms, such as school choice and vouchers, have become a recognizable strategy to increase public confidence in schools and produce school improvements through competition. State governments defined funding adequacy levels based on uniform academic performance standards. The No Child Left Behind federal legislation continued to increase local and state accountability for improved academic performance.

Expenditures per student increased 3.5% per year between 1890 and 1990 (Hanushek & Rivkin, 1997). Total adjusted expenditures per student from 1920 to 2001 increased from $440 to $8,194. In the United States, the student to public school instructional staff ratio fell from 26.1:1 in 1960 to 12.3:1 in 1999 (Skandera & Sousa, 2003). As these inputs have consistently increased, there continues to be considerable debate over their impact on student performance. According to Peterson (2003), "America's schools are stagnating, showing little improvement since *A Nation at Risk* was written. In fact, by some measures educational performance has fallen below the standards set by previous generations" (p. 41). His findings were based on his analysis

of SAT and NAEP scores from 1967 to 2000. However, Grissmer, Flanagan, Kawata, and Williamson's (2000) analysis of NAEP performance found significant math performance gains when he included the impact of population changes and family effects, especially in Texas and North Carolina. These two states utilized highly developed academic performance accountability systems.

Numerous studies on the relationship of expenditures to student achievement have yielded mixed results. After two decades of production function research following the 1966 U.S. Government sponsored report, *Equality of Educational Opportunity*, hereafter referred to as the Coleman Report, Hanushek (1986) analyzed numerous studies and found no systematic relationship between expenditures and student achievement. Other researchers extended this line of research with similar results (Hanushek, 1989; Stephens 1997; Drake, 1995; Clark, 1998; Nyhan & Alkadry M. G., 1999; Cameron 2000; Lyons 2001; Okpala, 2002; Standard & Poor's, 2006).

Hanushek's (1986) methods and findings were questioned in an extensive meta-analysis conducted by Greenwald, Hedges, and Laine (1996). Hanushek had found no systematic relationship between resources and student achievement while Greenwald, Hedges and Laine found strong positive relationships between expenditures for instruction and student achievement. Other studies have shown a positive relationship between funding used for instructional purposes and student achievement (Childs & Shakeshaft, 1986; Wendling & Cohen, 1981; Ferguson, 1991; Cooper, Sarrel, Darvas, Meier, Samuels, and Heinbuch, 1994; Wenglinsky, 1997; Stegmaier Nappi, 1998; Richardson, 2000; Malone, 2000). After decades of research, there is still much to gain from additional production function studies.

Purpose of the Study

Patrick Byrne (2005) has launched a nationwide campaign on the issue of resource allocations through his Website, www.firstclasseducation.org. The central focus of Byrne's campaign is for each of the 50 states to pass a law requiring every school district to spend 65% of its educational operating budget in classrooms for the benefit of children (Byrne, 2005). According to Bracey (2006), Tim Mooney, an Arizona Republican consultant, was the initial advocate for the 65% mandate. The recognized name, 65% Solution, was provided by George F. Will, a writer for the *Washington Post* (Bracey, 2006). In other literature it has also been referred to as "65 Percent Solution." Several states, including Florida, Missouri and Texas, have either considered or mandated the 65% Solution. Texas has since required all school districts to dedicate 65% of their operating budgets to instructional activities.

Texas has been considered a leader in the development of school accountability through its statewide curriculum standards, comprehensive assessment system, and a system for rating schools and districts based on student achievement. Because of the wealth of relevant data this system provides and the idea of the 65% Solution, this study was conducted to see if a relationship existed between the district percentage of instructional expenditures and the state's accountability requirements for school districts.

In 2003-2004 school year, Texas added two new financial indicators to the Academic Excellence Indicator System (AEIS) report called the Instructional Staff Percent (ISP) and the Texas Education Agency Instructional Expenditure Ratio (TIER). The ISP indicated the percentage of the district's full-time equivalent employees directly

providing classroom instruction to students during the 2003-04 school year. The TIER indicated the district percentage of the total actual expenditures dedicated to instruction during the 2003-04 school year.

Both measurements represented expenditures dedicated to instruction including instructional resource and media (library), curriculum and staff development, and guidance and counseling. However, the ISP represented only hours directly related to these activities. The TIER was a measure of the percentage of actual expenditures related to instructional activities (Texas Education Agency AEIS Glossary, 2004).

The 65% Solution was aligned with the definition established by the National Center for Education Statistics (NCES). The NCES definition included only the functions that were directly related to classroom activities, such as direct interaction between teachers and students (National Center for Education Statistics, 2003). Both the Texas Education Agency (TEA) and the NCES considered these expenditure representations as direct instructional activities. Texas has not established the exact definition for the 65% Solution at this time, but the TIER, NCES instructional expenditure ratio (NIER) or 65% Solution, and the ISP were selected as valid instructional expenditure measures for this study.

In addition to financial information, Texas gathered comprehensive student performance data in order to rate each district's overall performance and to measure the district's progress toward mastering the state curriculum. Students demonstrated competency in subject areas, including reading/English language arts, mathematics, science, and social studies, through an assessment system called the Texas Assessment of Knowledge and Skills (TAKS). The study utilized district performance

measures in reading/English language arts (TAKS Reading/ELA) and Mathematics (TAKS Math) to test for a relationship between the previously mentioned instructional expenditure measures and district performance in these areas. The results of all students and specific student populations were reported to the TEA. Texas districts were then assigned a rating label based largely on the results of the TAKS assessment results.

The core purpose of this study was to see if a relationship existed between specific AEIS performance indicators in TAKS Reading/ELA and Math and the ISP, TIER, and NIER. A second purpose of this study was to analyze the relationship between these instructional expenditure measurements and higher levels of student performance. In addition to a minimum passing standard, referred to as the Panel Recommended, Texas established a higher achievement standard, referred to as Commended Performance. This study analyzed the relationship of the ISP, TIER, and NIER to the Panel Recommended and Commended Performance standards in TAKS Reading/ELA and Math .

<center>Significance of the Study</center>

This study was important for several reasons. Public education costs continue to increase, but according to national assessments, student achievement has shown little improvement over the past three decades in spite of numerous input-based policies (Hanushek & Rivkin, 1997; Peterson, 2003). Schools were calling for additional resources to keep up with increasing national and state accountability standards, while policy-makers debated reform efforts of equity, adequacy, and school choice as a result of an apparent decline in public support for public schools due to increased taxation and

questionable efficiency. Decades of research studies had produced mixed results regarding the impact of resources on student achievement. If a relationship exists between specific instructional spending patterns and school performance; policy-makers, courts, and school administrators will hopefully use these findings to develop resource allocation plans to improve student achievement and meet accountability goals.

Research Questions

1. Is there a relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

2. Is there a relationship between the AEIS base indicator TAKS Math in Texas public schools and Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

3. Is there a relationship between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (ISP), and the NCES Instructional Expenditure Ratio (NIER)?

4. Is there a relationship between the AEIS Commended Performance indicator TAKS Math in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

The following null hypothesis statements were developed from the research questions:

1. There is no relationship between the AEIS base indicator TAKS Reading/English

    Language Arts in Texas public schools and the:

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

2. There is no relationship between the AEIS base indicator TAKS Math in Texas

    public schools and the:

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

3. There is no relationship between the AEIS Commended Performance indicator

    TAKS Reading/English Language Arts in Texas public schools and the:

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

4. There is no relationship between the AEIS Commended Performance indicator

    TAKS Math in Texas public schools and the ISP.

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

Definition of Terms

- Academic Excellence Indicator System (AEIS): Comprehensive school performance and accountability reporting system for Texas public schools.

- Accountability: Comprehensive systems for establishing academic performance standards and assessment, and for assigning consequences to schools, districts, and states.

- Adjusted expenditures per pupil: Expenditures that have been adjusted according to an established index such as the consumer price index.

- Consumer price index: Measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services.

- Economically disadvantaged: Students coded as eligible for free or reduced-price lunch or eligible for other public assistance.

- First Class Education (FCE): Washington-based organization with the goal of getting a law passed in every state that requires every school district to allocate at least 65% of their operating budget to be dedicated to direct instructional activities.

- Financial Accountability Resource Guide: Comprehensive financial accounting guide for Texas public schools.

- Instructional Expenditure Ratio (IER): Percentage of the district's total actual expenditures that are used to fund direct instructional activities.

- Instructional Staff Percent (ISP): Percentage of staff hours for direct instructional activities for a school district or charter school is determined by dividing staff hours in instruction, instructional resources and media services, curriculum development and

instructional staff development, and guidance and counseling services by total staff hours.

- Iowa Test of Basic Skills (ITBS): Voluntary, non-profit cooperative testing program for grades K-8.

- National Assessment of Educational Progress (NAEP): Also known as "the Nation's Report Card" and the only nationally representative and continuing assessment of what America's students know in various subject areas.

- National Center for Education Statistics (NCES): Primary federal entity for collecting and analyzing data related to education in the United States and other nations.

- NCES instructional expenditure ratio (NIER): Percentage of the budget dedicated to functions that are directly related to classroom activities, such as activities related to direct interaction between teachers and students.

- Production function: Research studies employing statistical methods to determine the relationship between inputs and outputs. It is sometimes called cost function analysis or input-output analysis.

- Student to-teacher ratio: Number of students per teacher.

- Scholastic Aptitude Test (SAT): Assessment designed by the Educational Testing Service to measure performance levels in math and verbal skills.

- TAKS Commended Performance: Highest performance level on the TAKS set by the State Board of Education. Students who achieve Commended Performance have performed at a level that was considerably above the state passing standard and have shown a thorough understanding of the knowledge and skills at the tested grade level.

- TAKS Panel Recommended passing standard: Minimum passing standard for the new TAKS test. Because the new TAKS is much more challenging than its predecessor, the Texas Assessment of Academic Skills (TAAS), the Texas State Board of Education agreed to a transition plan to phase in passing standards over several years.

- Texas Assessment of Knowledge and Skills (TAKS): Comprehensive testing program for public school students in grades 3-11. The TAKS is designed to measure to what extent a student has learned, understood, and is able to apply the important concepts and skills expected at each grade level tested.

- Texas Higher Education Coordinating Board (THECB): Created by the Texas Legislature in 1965 to provide leadership and coordination for the Texas higher education system to achieve excellence for the college education of Texas students.

- Texas Instructional Expenditure Ratio (TIER): Percentage of expenditures dedicated to instruction including instructional resource & media (library), curriculum & staff development, and guidance & counseling, in relation to the general operating budget.

Limitations and Delimitations

Limitations

The study was limited to one year of resource and performance data. 2003-04 was the first year that Texas included the Instructional Staff Percent and the Instructional Expenditure Ratio, in the AEIS report. The 2003-04 school year was the first year the TAKS Reading/ELA district passing percentage represented a combined result of the reading and writing assessments. In previous years, the district received

an overall passing rate for separate language arts assessments: reading and writing. Also, the prior year's TAKS administrations were evaluated by a lower passing standard in order to phase in the eventual Panel Recommended standard.

Another limitation was that the overall district TAKS passing percentage did not represent 100% of the students. Since only grades 3-11 were evaluated, the analysis represented approximately 80% of the student population of each district. Also, the student achievement variable, TAKS, was an assessment specific to Texas students and Texas standards. There was no direct correlation to national tests, such as the NAEP or SAT.

Since Texas utilized a wealth equalization system to establish equitable funding levels for each of the school districts, the ISP, TIER, and NIER are limited to comparisons of Texas districts. These measurements represent proportional expenditures. Texas districts had the same general access and limits to revenue.

Delimitations

The delimitations of the proposed study focused on the development of the analysis sample and the selection of the district performance variables. The sample was limited to Texas grades K-12 public school districts that had at least 1,000 students and reported data for the 2003-04 school year. The student achievement variables were limited to the district results in TAKS Reading/ELA and Math since these variables represented the majority of the students in the district.

Summary

For decades, elementary and secondary education costs continued to rise in the form of additional instructional and non-instructional resources (Hanushek & Rivkin,

1997). The increased burden on the taxpayers and an apparent lack of proportional

student achievement gains had caused policy-makers to view the public schools

through a new lens of efficiency and accountability (Peterson, 2003). By 2005, Texas

created a new policy requiring every district to direct a minimum of 65% of its general

operating budget to direct instructional activities. The purpose of this study was to

answer the following overarching question: Is the district percentage of instructional

expenditures related to varying levels of student achievement?

CHAPTER 2

LITERATURE REVIEW OUTLINE

School resource policies prior to the 1966 release of the Coleman Report and the findings of *A Nation at Risk* (1983), primarily focused on the equitable distribution of inputs without a noticeable consideration for performance outcomes. Generally, the message from these studies pointed toward two highly accepted concepts.   First, there did not seem to be a significant relationship between the educational resource inputs and student achievement. And second, student achievement variation appeared to be highly related to the magnitude of differences in socio-economic characteristics and diverse demographics within the public school system and not a result of the schools' efforts. The findings from these reports were considered the flashpoints that led to an increase in research studies and school reforms in the areas of student achievement, accountability, efficiency, and production function relationships. The following literature review explored the major factors that led to the development of production function research. Applicable research studies and methodology issues were reviewed along with a brief review of public school accountability systems.

Instructional Resource Trends and Student Achievement

For decades, educational resource inputs have increased at every level. Student to teacher ratios have continued to decrease, teacher experience has improved, and greater percentages of teachers have advanced academic degrees. However, in the United States, the overall percentage of the educational dollar directed

toward instructional activities has remained at approximately 60%. These instructional input increases and other non-instructional resource increases, along with the lack of proportional student achievement results, had spawned numerous studies comparing fiscal resources to student performance (Hanushek & Raymond, 2001).

Public School Fiscal Input Trends

Total per pupil expenditures in the United States increased from $373 in 1919-20 to $7,507 in 2000-01 after adjustments according to the consumer price index. From 1970-1973 and 1983-1988, the largest average annual increases at just over 4% were recorded. In Texas, the total unadjusted per pupil expenditures followed a similar pattern by increasing from $1,740 per student in 1980 to $6,539 per student by 2000 (Digest of Education, 2004, Table 66). Skandera & Sousa (2003) reported several reasons for increases in per pupil spending. Special education student expenditure increases explained about 20 percent of the expenditure growth between 1980 and 1990. Pupil-teacher ratios fell from 22.3:1 to 17.3:1 from 1970 to 1995. Teacher salaries increased as the median teacher experience increased from 8 years to 15 years for the same time period. The percentage of teachers with a master's degree increased from 27.5 percent in 1970 to 56.2 percent in 1995, and growth in expenditures, other than instructional salaries, explain a large share of the cost increases (p. 198-199). Hanushek, Rifkin, and Taylor (1996) reported similar findings in their analysis of twentieth century expenditure growth in U.S. school spending.

In the 2001-02 school year, Texas per pupil spending ranked thirty-sixth in the United States at $6,771 and thirty-sixth for instructional spending at $4,089 (Digest of Education Statistics, 2004, Table 165). Expenditure changes followed the U.S. trend

with substantial increases reported from $551 per pupil in 1969 to the $6,771 per pupil

in 2001-02. However, from 1999 to 2002 only small increases in per pupil spending

were shown. Along with expenditure increases, teacher to student ratios fell from

15.3:1 in 1997 to 14.8:1 in 2001 (Digest of Education Statistics, 2004, Table 66). In

fact, a substantial decrease in the ratio of non-teaching professionals per student

occurred from 86.9:1 in 1991-92 to 63.8:1 in 2004-05 (Texas Education Agency Pocket

Edition, 1991-92; 2004-05). This decrease in the ratio of non-teaching professionals

indicated an overall increase in non-instructional spending. This trend led to public

criticism of expenditure allocation decisions by school leaders.

These findings indicate that additional resources have been invested in the public

schools. Arguably, instructional resource strategies, such as lower pupil to teacher

ratios, greater teacher experience, higher salaries, and more advanced degrees were

considered to be fundamental resource interventions for improved student performance.

Student Achievement

A common research strategy for evaluating the overall performance of schools

and systems was to use a nationally recognized assessment tool. From a national

perspective, the two most comprehensive longitudinal assessments of student

achievement were the National Assessment of Educational Progress (NAEP) and the

Scholastic Aptitude Test (SAT).

NAEP

The National Assessment of Educational Progress (NAEP) test was designed by

the Educational Testing Service, which also designed the SAT. The test was

administered by the NCES to carefully selected samples from all students in public

schools. Over the past three decades, student learning has been measured in reading, math, and science at various student age levels. The NAEP has no direct accountability impact to schools, and schools can voluntarily decline to participate. School-student participation rates dropped from 68% in 1973 to 58% in 1999 (Peterson, 2003, p. 48). Although these limitations existed, the NAEP was used extensively to measure value-added effects of educational inputs (Peterson, 2003).

There has been considerable debate regarding the evidence of educational progress represented by the NAEP. Hanushek's (2003) analysis of NAEP scores produced a critical view of the nation's educational progress in light of the substantial resource changes since the 1970s. According to Hanushek, pupil-teacher ratios fell 40% between 1960 and 2000. Teacher experience and the percentage of teachers with at least a masters degrees doubled during the same time period. However, science scores for 17-year-olds were significantly lower in 1999 compared to 1970, and math and reading scores for the same age group indicated only slight increases in the same time period (Hanushek, 2003, p. 67-69). Skandara and Sousa (2003) noted a slight increase in NAEP science scores for 17-year-olds between 1990 and 1999, but reading scores for 17-year-olds and writing scores for eleventh graders decreased over the same time period. According to the 2005 NAEP Reading assessment results,

Between 1992 and 2005, there was no significant change in the percentage of fourth-graders performing at or above Basic, but the percentage performing at or above Proficient increased during this time period. The percentage of eighth-graders performing at or above Basic was higher in 2005 (73 percent) than in 1992 (69 percent), but there was no significant change in the percentage scoring

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at or above Proficient between these same years. (The Nation's Report Card

2005, Reading Summary)

However, NAEP math assessment results showed improvement through

this same time period. In 1990, 50 percent of fourth grade students met the

Basic standard compared to 80 percent in 2005. Proficient levels increased from

13 percent to 36 percent during the same time period. (The Nation's Report Card,

2005, Mathematics Summary)

Peterson (2003) pointed to a nearly 40% rise in the standard deviation in the math

scores of 9-year-olds between 1973 and 1999. "Yet, these gains have not been

sustained as the child moves on to middle and high school" (p. 51).

Hedges and Greenwald (1996) did not agree with Hanushek's (1996) conclusion

that the NAEP data failed to show a trend of increases over the past two decades.

Their analysis of NAEP data from 1970 to 1992 looked beyond the aggregate mean

scores for all students and illustrated significant gains for Black and Hispanic students

over the past two decades. The overall math achievement for Black and Hispanic

students increased by one-half of a standard deviation between 1973 and 1992

(Hedges & Greenwald, 1996, p. 78). Hedges and Greenwald went on to explain the

decline in social capital as an important factor impacting academic performance.

Between 1950 and 1990, the percentage of working mothers rose from 16% to 59%.

Children living with their mothers only increased from 6.4% to 20% during the same

time period. Births to unmarried women, increased from 5% in 1960 to 22% by 1986

(Hedges & Greenwald, 1996, pg. 79-80). They concluded that the achievement decline

should be expected when considering the eroding social capital and family

characteristics. The fact that achievement has not declined substantially, and for some ethnic groups has increased, is evidence that achievement has actually increased as a result of schooling and added resources (Hedges & Greenwald, 1996).

Grissmer et al.'s (2000) study found significant gains in NAEP scores when comparing students with similar family background characteristics. This extensive study utilized the substantial educational resource differences that existed between the states within the United States in relation to their scores on the NAEP. From a sample of 44 states, a statistically significant 1% gain was shown for public elementary students in math between 1990 and 1996. Texas and North Carolina demonstrated large, statistically significant gains during this same time period (Grissmer et al., 2000, xxiii-xxiv). These gains demonstrated a positive NAEP relationship to state level reform efforts and various instructional resource inputs, such as increased overall instructional expenditures and lower student to teacher ratios (Grissmer et al., 2000).

SAT

The SAT, formally known as the Scholastic Aptitude Test, has been a fundamental measure of educational progress.   The test has some major advantages over other assessments.   It has been used for decades to measure the overall academic capacity obtained during the high school experience and motivates students to perform well due to the consequences associated with a low score.   Many colleges and universities have used the SAT as a major part of the college admissions process. The SAT is designed by the Educational Testing Service to measure performance levels in math and verbal skills.   As with any student achievement measure, there are some limitations with the use of the SAT for production function studies. For example, not all

students take the test. In 2000, only 46% of high school seniors took the SAT (Peterson, 2003, p. 44). Hedges & Greenwald (1996) stated that the self-selection characteristic of the SAT could produce misleading results. However, its longitudinal consistency and its impact toward college admissions have made it a valuable research variable for resource efficiency studies.

In Peterson's (2003) review of SAT scores from 1967 to 2000, the combined score fell nearly 30% of a standard deviation between 1967 and 1982 (p. 45). This significant change helped prompt the writing of *A Nation at Risk*. Between 1967 and 1982, average verbal scores declined by 35% of a standard deviation and have never fully recovered. This decline slowed after this time period. But on the whole, there has been little improvement (Peterson, 2003). Skandera & Sousa (2003) stated similar conclusions even with the record of additional instructional time dedicated to college prep courses. In some cases, SAT scores declined in relationship to additional time spent in teaching math and reading (Skandera & Sousa, 2003).

Research Studies Comparing Expenditures to Student Achievement

Research studies related to educational resource productivity have been conducted since the early twentieth century (Cameron, 2000). The findings of the the Coleman Report (1966) significantly enhanced the interest in studying the impact of school resources on student performance. In summary, the Coleman Report (1966) found little relationship between variations in books, curriculum, and facilities and student performance when social background and student attitudes are held constant. The effect of a student's peers was the most important explanation for varying student achievement results (Bowles & Levin, 1968).

Production function studies—also referred to as input-output, cost-quality, or cost function—have produced a mixture of findings. These studies generally attempted to analyze the impact of resources on achievement while students were in elementary or secondary school or on the students' future performance in the labor market (Burtless, 1996). According to Childs & Shakeshaft (1986), production function findings typically fell into three categories: "studies which indicate no relationship, studies which indicate a positive relationship, and studies which indicate a positive relationship only under specified conditions" (p. 250).

Summary of Production Function Studies

Since the 1950s, researchers have attempted to link broad level instructional resource definitions to student outcomes.   As previously mentioned, the Coleman Report (1966) became the recognized standard and acceptance of poor efficiency in public schools (Wendling & Cohen, 1981). However, researchers have built upon the knowledge of estimation models from previous research, and the educational systems have improved categorical accounting measures in specific areas, thus allowing more precise research models and potentially important findings.

Educational production function studies were generally a statistical comparison of educational inputs to specific outcomes. Fortune (1994) identified production function statistical methods as two types: simple linear regression or the multiple regression approach. In their basic form, educational production function studies attempted to discover relationships between educational resources (inputs), such as teaching strategies, programs, personnel, instructional materials, non-school variables (student, family, and peers), and student performance. These studies were derived from the field

of economics where combinations of resources were utilized in order to maximize production (MacPhail-Wilcox & King, 1986).

Most production function studies focused on immediate performance outcomes (test scores) that aligned with coexisting inputs. However, other measures of educational performance, such as adult earnings, return to schooling and educational attainment, have been analyzed through production function models. Card and Kruger's (1996) study conducted statistical analyses of four separate male birth cohorts from 1920 to 1950. Adult earnings were compared to several school quality indicators in an effort to estimate the impact of educational resources. Their results suggested that a significant relationship existed between the cost and quantity of educational resources and that earning gains were linked to educational attainment.

Betts (1996) continued this line of research on adult earnings and educational inputs. He discovered that the significant relationships concluded by Card & Krueger (1996) seemed evident only in men educated in the earlier half of the century, and the use of state level data as opposed to school or classroom level seemed to produce statistically higher results. One significant finding was that spending on additional years of education appeared to be a better investment than increasing expenditures per pupil (Betts, 1996, p. 184).

Previous production function analyses and summaries designed to estimate the impact of resources on student performance provided the most relevant connection to this study. Childs & Shakeshaft (1986) conducted a meta-analysis of 45 dissertations and publications that specifically analyzed the relationship of expenditures to student test scores.   They sought to answer two questions: What was the relationship between

educational expenditures and student achievement, and under which conditions did additional resources explain higher student achievement? In their analysis of 417 studies, 298 positive correlations and 199 negative correlations were found.

> The results of the meta-analysis showed a small amount of variance, (1.04 percent), in the reported correlation between educational expenditures and student achievement in studies using mean correlations (n = 400). Instructional costs (school districts) and instructional costs divided by weighted average daily attendance produced the largest amount of variance among educational expenditures accounting for 6 and 9 percent of the variance respectively. (Childs & Shakeshaft, 1986, p. 255-256)

Student achievement gains in math and science showed a stronger relationship to expenditure increases than those compared to language arts.   However, few cases where expenditures accounted for more than 4% of the variance student performance were found (Childs & Shakeshaft, 1986, p. 259). The overall conclusion suggested a potential relationship between varying levels of instructional expenditures and student achievement.   Their findings indicated that some significance exists between student performance and resources, but it seems to decline over time (Childs & Shakeshaft, 1986).

Hanushek (1986) conducted a meta-analysis of 147 studies of educational production functions.   Of 112 studies comparing pupil to teacher ratios to student performance, only 23 were statistically significant, and only nine produced a positive correlation (p. 1161). Of the remaining 89 statistically insignificant studies, 43 demonstrated a negative correlation, and 21 did not report a correlation sign

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(Hanushek, 1986, p. 1161). Similar results were reported for teacher education, teacher

salary, and expenditures per pupil. However, Hanushek (1986) found a majority of the

coefficients comparing teacher experience with student achievement pointing in a

positive direction. Based on the overall results, Hanushek (1986) stated the following

conclusion: "There appears to be no strong or systematic relationship between

expenditures and student performance" (p. 1162).

Hanushek (1996) continued this line of research of 377 studies through 1994.

His conclusions aligned with the findings from the previous 1986 study. Seventy-five

percent of these studies involved some kind of standardized test score (Hanushek,

1996, p. 60). Of the 277 studies comparing student to teacher ratios, only 15% showed

a statistically significant positive direction (Hanushek, 1996, p. 55). As he found in

1986, 30% of the studies for teacher experience carried a positive correlation sign and

significance (Hanushek, 1986, p. 1161; Hanushek, 1996, p. 55). However, Hanushek

(1996) concluded that 71% of the studies were statistically negative or insignificant (p.

56). Hanushek (1996) made the following statements related to these conclusions:

> They do not say that resources *could not* be effective in raising student
>
> achievement; they say only that there is little reason to expect improved
>
> achievement from added resources in schools as currently organized and run.
>
> Second, the results do no say that school resources never have an
>
> impact. (p. 57)

Hedges and Greenwald (1996) disputed Hanushek's (1996) conclusions that little

evidence existed to support the impact of additional resources on student achievement.

Their reanalysis of Hanushek's work utilized a revised model by creating a new universe

of studies in which one-third of the studies were longitudinal (Hedges, Laine, & Greenwald, 1996). Utilizing combined significance testing, their findings suggested that strong relationships existed between educational inputs and student achievement.

> In the new universe, the trimmed subsamples provide evidence that at least some of the coefficients associated with the teacher-pupil ratio in combined significance analyses are positive, but no evidence that any coefficients associated with this input variable in the combined significance analyses are negative. These results lead us to conclude that smaller classes are associated with higher achievement. (Hedges, Laine & Greenwald, 1996, p. 86)

Their revised estimation model also produced robust relationships between teacher education and student achievement and consistently positive relationships between teacher experience and per-pupil expenditures and student achievement (Hedges & Greenwald, 1996). Results from other studies supported the idea that specific resource allocations provided important explanations for varying student achievement levels (Ferguson, 1991; Cooper et al., 1994; Wenglinsky, 1997; Clark, 1998).

Wengling and Cohen (1981) used regression analysis in their study of New York schools. They compared composite third grade math and reading scores as dependent variables to teacher experience, teacher characteristics, school characteristics, per-pupil expenditures, instructional expenditures, and socioeconomic status as independent variables. Their findings indicated that teacher qualifications and student to teacher ratios were both related to higher third grade reading and math results. Wengling and Cohen (1981) concluded that "greater expenditures per pupil were associated greater levels of reading achievement" (p. 53-53). They also found that

operating expenditures and instructional expenditures demonstrated the same association to student achievement. They reported that "an increase of one dollar in either is associated with .001 improvement in achievement" (Wengling & Cohen, 1981, p. 54).

Ferguson (1991) conducted a study in Texas school districts by comparing school qualities, such as teacher literacy, student to teacher ratios, and instructional spending to Texas Educational Assessment of Minimum Skills (TEAMS). Ferguson implemented extensive controls for regional cost differences and concluded that these inputs showed significantly positive relationships to TEAMS performance. Other researchers have produced similar findings specifically with instructional inputs (Cooper et al., 1994; Wenglinsky, 1997; Harter, 1998; Malone, 2000). A notable finding came from Fermanich (2003) when expenditures for professional development showed a positive relationship to the quality of math instruction.

In spite of the efforts of many researchers, the majority of these types of studies have produced limited results of practical or statistical significance (Drake, 1994; Stephens 1997; Clark, 1998; Cameron, 2000; Okpala, 2002). However, the review of the literature would suggest a common thread of statistically significant findings for instructional inputs such as teacher quality, lower student to teacher ratios, teacher qualifications, experience, and instructional expenditures.

Studies that correlate proportional measures of instructional inputs such as the selected independent variables for this study (ISP, TIER, NIER) were rare. Dombrowski (1993) conducted a study to develop instructional expenditure ratios for similar school districts to determine if districts allocated differing amounts of instructional resources

depending on district size and wealth. Measures of student achievement were not part of the study.

The 65% Solution was an input-driven initiative without a measurable outcome. Based on the NCES spending categories that are included in the 65% Solution, the national average for spending on instruction was 61.4% at the time of this study (Bracey, 2006, p. Executive Summary). In order to meet the 65% minimum allocation to instructional activities, districts would need to shift $13 billion in funds from outside the classroom (administration, plant operations and maintenance, food service, transportation, teacher training, student support services) (Bracey, 2006). Standard & Poor's (S&P), an internationally respected investment advisory group, created an educational database, www.schoolmatters.com, in response to the national interest in mandating school funding efficiency through the 65% Solution. S&P (2006) conducted a production function study to compare the NIER to student performance in states that were currently considering this input-driven policy. S&P posed the following three questions to guide the study.

- What do the data reveal about the relationship between spending allocations and student achievement?
- What are the definitional issues to consider when determining the percentage a district spends on instruction?
- What questions should policy-makers consider in connection with the 65 Percent Solution? (Standard & Poor's, 2006, p. 2)

S&P (2006) compared state-specific district math and reading results to their specific NIER. Regardless of the districts' NIER, S&P did not find a significant

relationship between a minimum or maximum percent spent on instruction to math and reading performance. The states evaluated were Minnesota, Louisiana, Ohio, Texas, Kentucky, Florida, Kansas, and Colorado. R^2 values were calculated ranging from .0008 (<1%) in Minnesota to .067 (6.7%) in Ohio. Interestingly, Minnesota has the greatest number of districts that allocate more than 65% to instruction (Standard & Poor's, 2006). Currently, only 23% of all school districts in the U.S. spend 65% or more on instruction (Standard & Poor's, 2006, Addendum).

S&P (2006) went on to offer suggestions regarding the expenditure definitions within the 65% Solution, such as adding pupil and instructional support services. They were not suggesting that increasing the instructional proportion of the education dollar will not improve student achievement. S&P (2006) stated the following conclusion:

> While the data do not support mandating a minimum instructional spending threshold applied uniformly across all districts, monitoring the percentage districts allocate to instruction is a useful benchmark in assessing the district's return on resources. To that end, the definitional debate surrounding the 65 Percent Solution is instructive in defining that ratio. As policy-makers search for ways to ensure that districts are minimizing inefficiencies and optimizing the effectiveness of their resources, transparent data reporting is an essential first step. Additionally, examining how the most resource-effective districts (i.e., high achieving, lower spending districts) have allocated their instructional resources will offer invaluable insights into the particular instructional activities that tend to result in higher student performance. (p. 8)

They acknowledged that other services may need to be included in order to meet the diverse needs of students (Standard & Poor's, 2006).

Issues with Production Function Research Models

The body of educational production function research was confronted with substantial analytical problems. A common criticism was the lack of student achievement measures or instructional resource measures. Another major issue was the use of district-level data instead of school or classroom data.   School-and classroom-level data might provide a closer linkage between the resource and the student (Burtless, 1996).   However, district-level data were usually more accessible. The following discussions will explore the common problems identified within production function research models.

Not long after the Coleman Report (1966), a considerable amount of attention was devoted to the analysis of the methods used to estimate the impact of educational resources.   Bowles & Levin's (1968) analysis of the report suggested several problems with Coleman's findings. They cited problems related to a poor sample response and specifically the non-random accounting of non-responses that might have led to erroneous findings. They also pointed to the neutral treatment of student background characteristics as a major cause of questionable findings since these factors were known to have a dramatic impact on student achievement (Bowles & Levin 1968). The methodological control of differences in individual students is still a major problem in production function research today. Fortune (1994) suggested the analysis of homogenous groups for such characteristics as school or district size, wealth, or student characteristics as effective controls for differences in subjects.

Another difficult challenge in developing and implementing estimation models was variable specification (Fortune 1994). For example, a variable such as district per-pupil expenditures might not represent the same purchasing power between districts. The outcome measurement was sometimes out of alignment with the input variable. For example, it was difficult to link transportation costs to student test scores. Fortune (1994) identified four issues related to the selection of output variables.

First, the chosen output variable may be a minor emphasis in many schools. Second, the output variable may have a floor or ceiling effect which could leave an unknown amount of actual performance. Third, the output variable may have no clear linkage to the input variable or school quality. Fourth, a variable specification problem occurs when the measurement does not represent the whole student body. (p. 29)

A final variable specification issue was related to the level of data aggregation. Research had shown as data become more aggregated, such as district-or state-level averages, there was a clear upward bias toward positive resource effects (Hanushek, et al., 1996).

Accountability

As previously discussed, increased spending for instructional resources has occurred over the past few decades. During this same time period, student achievement has remained relatively unchanged according to the results of national measurements, such as the SAT and NAEP. These factors, along with inconclusive findings from educational production function research, have led to the development of state and national accountability systems to hold teachers, schools, and school districts

accountable for the academic performance of students (Ravitch, 2002). The following

discussions will provide a brief summary of the history, components, and characteristics

of state and accountability systems. Finally, a comprehensive review of the Texas

school accountability system will be included.

Historical Perspective

The concept of measuring the quality of education from evidence of student

performance does not have a long history (Ravitch, 2002). Hanushek & Raymond

(2001) identified that the basic principle of accountability was to "link outcomes to the

behavior of each actor" (p. 376). As early as the nineteenth century, students were held

accountable for passing subject level tests before progressing to the next level.

Teachers of the same time period were often required to pass a general knowledge test

before being considered for employment. In the early 20th century, testing evolved from

a simple recall to a more rigorous format largely due to the work of Edward L. Thorndike

(Ravitch, 2002).   Thorndike was committed to proving that education could become an

exact science. But in this early time period, he never considered the use of testing for

purposes of accountability (Ravitch, 2002).   By the 1980s, governors were requesting

the help of business leaders to help improve the educational system. Ravitch stated:

> The business leaders looked at the schools through the lenses that were
>
> customary to them. They expected transparency of reporting about budget,
>
> resources, operations, and results; they expected to see accountability for
>
> performance. And they encouraged governors and other elected officials to
>
> consider incentive structures that worked routinely in business to improve
>
> performance. (p. 16)

The prevailing philosophy of transparency and performance reporting was that a public armed with performance data was a much more effective quality control enforcer than any state or national agency.

The evolution to performance accountability has not been an easy journey. Policy-makers continued to propose the need for reform and improved efficiency. Educators asked for more instructional resources.   A good example of this conflict was the 1993 Massachusetts school reform laws that substantially increased instructional inputs and performance standards.   The expected results were not realized, and teacher groups fought to repeal the higher standards. However, states that had persisted in raising standards, such as Texas, California, and Massachusetts, experienced improved student achievement especially with African American and Hispanic students (Ravitch, 2002).

Overview of Accountability Systems

School accountability systems incorporate three fundamental components, sometimes referred to as the three legs of a tripod. The first leg represented the standards, which were the expected learning outcomes and results for the students. The second leg was testing or assessment, which was designed to measure the progress toward the standards. The third leg represented the consequences applied to schools and school systems from the comparison of the expected standards and the actual results.   All three of these legs must be sturdy for the system to have a chance at improving student achievement (Finn, 2002). These components were the fundamental parts of state and national school accountability.

State Accountability Systems

Skandera & Sousa (2003) found that by 1999-2000, 49 states had adopted standards in at least one subject area; 44 had standards for English, math, social studies, and science; 41 states had assessment aligned with at least one subject area; and 21 states had assessment instruments for the other core areas. Furthermore, Finn & Petrilli (2000) found that only five states had strong accountability systems: Alabama, California, North Carolina, South Carolina, and Texas. Hanushek & Raymond (2001) found by the end of the 1990's, 45 states had published school-level report cards and 34 states had published district level-reports. They also found that 17 states had a district rating system, and, of these states, 10 had systems for rating low-performing schools (Hanusheck & Raymond, 2001).

In 1993, the Texas Legislature enacted statutes that mandated the creation of the Texas public school accountability system to rate school districts and evaluate campuses. A viable and effective accountability system could be developed in Texas because the state already had the necessary supporting infrastructure in place: a pre-existing student-level data-collection system, a state-mandated curriculum, and a statewide assessment tied to the curriculum (Texas Education Agency Accountability Manual, 2004). The major parts of the system included student and school accountability, the collection of data into a performance database, the rating system, and the rewards and sanctions program based on the results of the state level assessment (Izumi & Williamson, 2002).

The primary focus of the Texas accountability system was the state assessment system. Since the late 1970's, the assessment program had changed considerably

through the evolution of the overall accountability system. The first formal assessment to explicitly link student assessment results to curriculum statewide was the Texas Assessment of Basic Skills (TABS). In 1979, the Texas Legislature passed a bill amending the Texas Education Code to require the TEA to adopt and administer a series of criterion-referenced assessments designed to assess basic skills competencies in mathematics, reading, and writing for students in grades 3, 5, and 9 (Texas Education Agency Technical Digest, 2004).

In 1984, the Texas Legislature changed the wording in the Texas Education Code from "basic skills competencies" to "minimum basic skills." This change was seen as a mandate to increase the rigor of the assessments and to add individual student sanctions for performance. The Texas Educational Assessment of Minimum Skills (TEAMS) replaced TABS as the new state mandated, criterion-referenced achievement test in the subjects of reading, mathematics, and writing. TEAMS was administered to students in grades 1, 3, 5, 7, 9, and 11, with the eleventh grade test being an "exit-level" assessment. Beginning with the graduating class of 1987, eleventh grade students were required to pass the exit-level tests in mathematics and English/language arts at the passing standard established by the State Board of Education (Texas Education Agency Technical Digest, 2004).

In the late 1980s, the State Board of Education directed TEA to make a number of changes to the assessment program. These changes were based on revisions of the Texas Education Code and the Texas Administrative Code. These changes included an expansion of the content being measured and greater emphasis on the assessment of problem-solving skills, with more content directly linked to the core curriculum. The new

assessment program, the Texas Assessment of Academic Skills (TAAS), was implemented in 1990. The TAAS testing program reflected the desires of both the Texas State Board of Education and the Commissioner of Education that Texas students should attain higher levels of academic achievement. The primary purpose of assessment in Texas had evolved from the collection of school-level information (TABS) to assessment of curriculum-specific minimum skills (TEAMS) to school accountability for student performance (TAAS). Beginning in the fall of 1990, TAAS was administered to students in grades 3, 4, 5, 6, 7, 8, and 10, with tenth grade serving as the exit-level test for graduation. In addition to meeting attendance and course requirements, students were required to meet the passing standard established by the State Board of Education to receive a high school diploma. The subject areas tested included reading, mathematics, and writing. The reading and mathematics tests were multiple-choice, while the writing test included a multiple-choice section and a writing sample (Texas Education Agency Technical Digest, 2004).

In 1999, the 76th Session of the Texas Legislature passed Senate Bill 103, which mandated the implementation of a new statewide testing program. The new testing requirements, subsequently named the Texas Assessment of Knowledge and Skills (TAKS), were implemented in spring 2003. By law, all eligible Texas public school students are assessed in mathematics in grades 3-11; reading in grades 3–9; writing in grades 4 and 7; English/language arts in grades 10 and 11; science in grades 5, 10, and 11; and social studies in grades 8, 10, and 11. Eleventh grade was also the exit-level test for graduation (Texas Education Agency Technical Digest, 2004). The TAKS

test was designed to be a more rigorous measurement of the students' mastery of the state curriculum.

Beyond the statutory compliance and subsequent accountability rating that were associated with TAKS results, the instrument offered other indications of effectiveness. Texas introduced the Texas Reading Initiative which was a reform measure designed to end social promotion of students. In 1999, the 79th Texas Legislature enacted a law requiring all third and fifth grade students to pass the reading portion of TAKS in order to be promoted to the next level (Texas Education Agency Grade Placement Committee Manual, 2004). Since the implementation of this reform and the reported improvement for Texas early grade levels on the Iowa Test of Basic Skills (ITBS), TEA stated a possible link between TAKS results through the Texas Reading Initiative and the ITBS. This finding was based on the improved scores of grades 3-5 in comparison to the upper grades. TEA Comissioner, Dr. Shirley Neely, stated, "The results on the Iowa Tests offer another validation that the Texas Reading Initiative, which focuses on grades 3-5, is paying off. These results also confirm that the state's increased focus on improving secondary schools is justified" (Texas Education Agency News, 2006, p. 1).

In addition to a previously mentioned relationship to the ITBS, eleventh grade exit-level TAKS Reading and Math scores could produce a benefit to students in regards to post-secondary success. Eleventh grade students with a scale score of 2200 on their TAKS Math and English language arts with a written composition score of "3" or higher were exempted from taking the TSI developmental test or developmental coursework in order to enroll in college English or math. This standard was set by the Texas Higher Education Coordinating Board (THECB). This indicator was referred to as

the Higher Education Readiness Component (Texas Education Agency AEIS Glossary, 2004-05).

Texas aggregated district- and school-level data through a comprehensive reporting system known as the Academic Excellence Indicator System (AEIS). Since 1990-91, campus and district AEIS reports have been generated and published annually for all campuses and districts in the state. Local districts shared the responsibility for disseminating the AEIS reports, including holding hearings for public discussion of the AEIS report content (Texas Education Agency Accountability Manual, 2004).

Summary

In the United States, the overall investment in elementary and secondary education has consistently increased over time. However, student achievement results have not shown a proportional response according to the highly-recognized measures, National Assessment of Educational Progress (NAEP) and the Scholastic Aptitude Test (SAT). The Coleman Report (1966) presented a dismal message regarding the effectiveness of schools and school resources on student achievement. These factors influenced a greater emphasis on school resource efficiency.

Researchers have developed an econometric model for estimating school resource efficiency known as production function research. Over the past three decades, results from production function studies have yielded a mixture of positive and negative findings. Consequently, there was considerable debate over the methodologies used to estimate the impact of resources on student achievement. And finally, the drive to improve school efficiency has evolved into a new age of school

accountability.   Texas was considered one of the leading states in the area of public

school accountability (Ravitch, 2002).   As accountability systems evolved and

measurement systems improved, production function research continued to yield

valuable information for educators and policy-makers.

CHAPTER 3

METHODOLOGY

This study sought to discover if a relationship exists between four criterion variables (Panel Recommended district percent passing for TAKS Reading/ELA and Math, and the district Commended Performance percentage for TAKS Reading/ELA and Math) and three predictor variables (Instructional Staff Percent (ISP), Texas Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER). The NIER is the instructional measure used in the 65% Solution. These three variables were all measures of the proportion of expenditure allocations dedicated to instructional activities. The purpose and structure of the study aligned with Cameron's (2000) study of relationships between per-pupil expenditures and selected base indicators in the Texas Academic Excellence Indicator System (Cameron, 2000). Cameron's findings showed little to no relationship between per-pupil expenditures and base AEIS indicators. Numerous other studies have reported similar findings while other studies have discovered that positive relationships did exist between higher per-pupil instructional expenditures and student achievement. This study extended the previous findings by exploring the relationship between instructional inputs and student achievement.

Although a substantial body of research exists comparing various instructional resources to student achievement, very little research exists on the relationship between student achievement and instructional resources as a percentage of the overall

expenditure allocations. This study will provide new insights into the debate over the impact of instructional allocations as a percentage of the overall educational expenditures. These insights will provide policy-makers with relevant information regarding the production effectiveness of such an input-based policy and regarding the components that make up the instructional dollar.

Research Design

The Coleman Report (1966) initiated a frenzy of educational input-output analysis research. This led to an economic approach to studying educational inputs-outputs known as "educational production functions" (Hanushek, 1979, p. 352). The use of statistical correlation has been the method of choice for many education production function studies. Researchers have generally accepted the following conceptual model to estimate the interaction between educational variables:

$$A = f(E, B, I)$$

where A = student achievement, E = educational inputs, B = background characteristics, I = innate ability (Harter, 1998; Deller & Rudnicki, 1993; Dolan & Schmidt, 1987; Ehrenberg & Brewer, 1994). Student achievement was seen as a function of inputs including resources, such as per-pupil expenditures, student to teacher ratios and teacher quality; background characteristics such as ethnicity and wealth; and the students' innate abilities. Researchers have developed numerous variations of this conceptual model to develop empirical tests for the impact of resources on educational performance.

A quantitative research design using descriptive and linear regression statistical techniques was used to study the relationship between the criterion and predictor

variables. The statistical software package SPSS 13.0 and Microsoft Excel were used to conduct four analyses. The following research questions guided the analysis.

1. Is there a relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

2. Is there a relationship between the AEIS base indicator TAKS Math in Texas public schools and Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

3. Is there a relationship between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (ISP), and the NCES Instructional Expenditure Ratio (NIER)?

4. Is there a relationship between the AEIS Commended Performance indicator TAKS Math in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

The following null hypotheses were developed from the research questions.

1. There is no relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the:

      a. Instructional Staff Percent (ISP)

      b. TEA Instructional Expenditure Ratio (TIER)

      c. NCES Instructional Expenditure Ratio (NIER)

2. There is no relationship between the AEIS base indicator TAKS Math in Texas public schools and the:

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

3. There is no relationship between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the:

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

4. There is no relationship between the AEIS Commended Performance indicator TAKS Math in Texas public schools and the ISP.

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

Population and Selection of Subjects

The subjects of education production function analysis represented varying levels, including national, state, district, school, and student levels. The district-level was the unit of observation and analysis. The Texas public school system provided a large, ethnically diverse system serving approximately 4.4 million students in public and charter school districts. Texas also used a highly developed financial and academic performance accountability system along with an extensive data collection system.

This analysis was limited to Texas public school districts that administered and reported performance results from the 2004 TAKS administration. In 2004, Texas collected academic and financial data on 1,227 public and charter districts. The goal of the sampling procedure was to create a large analysis sample of districts that are similar in the number of grades served, operate a regular public school program and possess a sufficiently large enrollment size avoid the economy of scale problems sometimes associated with small enrollment schools.

Of this population 190 charter schools (schools that do not operate a traditional school program) were removed along with 64 non-K-12 districts (districts that do not have a high school program). The sample was limited further to districts that have at least 1,000 students. This was done in order to achieve a large sample, but eliminate the economy of scale problems associated with very small districts. Six districts were eliminated because of incomplete data sets. Out of the initial 1,227 districts, 483 met the criteria. These districts represented just over 3.9 million students or 92% of the states public school population.

<div align="center">Variable Selection</div>

The selection of appropriate variables was essential for avoiding some of the previously discussed problems associated with production function research. The following paragraphs include a brief description and justification for the selection of the variables in the proposed study.

Criterion Variables

AEIS base indicators: TAKS Reading/English Language Arts and Mathematics

Although Texas administered the TAKS test in several core academic subjects, almost all grades 3-11 students take the Reading/ELA and Math assessment. Since the object of analysis was at the district level, it was necessary to use an output measure that represented a majority of the student population. Students in grades 3-11 were assessed in Reading/ELA and Math. According to the Texas Education Division for Performance Reporting, of the 2.9 million students enrolled in grades 3-11 during 2003-2004, 2.4 million or 83% took the Reading/ELA and Mathematics TAKS assessment.

In 2002, the Texas State Board of Education facilitated an extensive standard setting process and established three proficiency levels for measuring academic performance in a tested subject. Individual student performance on the TAKS was labeled based on a specified performance level. The following labels for student performance were found in the TEA AEIS Technical Digest (2004).

Commended Performance

- High academic achievement.

- Students performed at a level that was considerably above the state passing standard.

- Students demonstrated a thorough understanding of the knowledge and skills measured at this grade.

Met the Standard (Panel Recommended)

- Satisfactory academic achievement.

- Students performed at a level that was at or somewhat above the state passing standard.

- Students demonstrated a sufficient understanding of the knowledge and skills measured at this grade.

Did Not Meet the Standard

- Unsatisfactory academic achievement.

- Students performed at a level that was below the state passing standard.

- Students demonstrated an insufficient understanding of the knowledge and skills measured at this grade.

The district TAKS passing percentage was calculated by dividing the total number of test takers summed across grades 3-11 that met the Panel Recommended standard by the total number of test takers summed across grades 3-11. The Panel Recommended standard was a specific minimum scaled score as established by the State Board of Education. The scale score allowed scores to be compared with the standard and accommodated for differences in the difficulty of the test form used for each administration. For the entire state, 80% of all students met the Panel Recommended standard for TAKS Reading/ELA, and 66% met the same standard for TAKS Math (Texas Education Agency Accountability Manual, 2004).

Although numerous production function studies have been conducted, little research existed on the impact of instructional inputs on higher levels of student achievement. Texas created a TAKS proficiency level, known as Commended Performance, to indicate academic achievement at a level considerably higher than the state passing standard. This standard was established by the Texas State Board of Education. The percentage of students achieving the Commended Performance level

was calculated at the school, district, and state levels. This percentage was then

reported on the AEIS Report. For the entire state, 20% of all grades test takers met the

Commended Performance standard for TAKS Reading/ELA and 17% for TAKS Math.

The availability of the Commended Performance variable allowed the researcher to

determine if instructional expenditure measures have a comparable impact on higher

levels of student achievement (Texas Education Agency AEIS State Report, 2003-04).

Predictor Variables

  Instructional Staff Ratio (ISP)

  This measure was implemented for the 2003-04 school year as part of the AEIS

report. It was reported in the staffing section.   Although it was not listed in the financial

section of the report, it was used as a measure of expenditures that represented a cost

to the district. This new measure indicated the percentage of the district's full-time

equivalent employees whose job functions were to directly provide classroom instruction

to students during the 2003-04 school year. The ISP was a district-level measure and

was calculated as follows:

Total number of hours district staff reported under expenditure object codes
6112, 6119, and 6129, and function codes 11, 12, 13, and 31
_____
total number of hours worked by all employees

Expenditure object codes 6112, 6119, and 6129 were payroll accounting codes.

Function codes 11-13 and 31 were accounting codes for instruction (11), instructional

resources and media services (12), curriculum development and instructional staff

development (13), and guidance and counseling(31) (Texas Education Agency AEIS

Glossary, 2004, p. 15). The total number of calculated staff hours for each employee

was allocated according to the distribution of reported salary amounts by fund and

function per employee (School Financial Audits, 2004). The 2003-2004 state average

for this measure was 63.8% (Texas Education Agency AEIS State Report, 2003-04).

TEA Instructional Expenditure Ratio (TIER)

Texas required every school district to submit specific financial information at the

school and district level. In 2003-2004, TEA added a new financial indicator to the

Academic Excellence Indicator System report called the Instructional Expenditure Ratio.

This ratio represented the percentage of expenditures dedicated to instruction including

instructional resource and media (library), curriculum and staff development, and

guidance and counseling, in relation to the general operating budget (Texas Education

Agency AEIS Glossary, 2004). The exact definition and coding system of the functional

categories were outlined in the TEA (2004) Financial Accountability Resource Guide

and the TEA Technical Digest (2004). The TIER was a district-level measure and was

calculated as follows:

$$\frac{\text{Expenditures reported in function codes 11, 12, 13, and 31, and object codes}\text{ object codes 6112 thru 6499}}{\text{Expenditures reported in function codes 11-52, 92 and 95, and}\text{ object codes 6112 to 6499}}$$

Expenditure object codes 6112-6499 were payroll and all non-capital accounting codes.

Function codes 11-13 and 31 were accounting codes for instruction (11), instructional

resources and media services(12), curriculum development and instructional staff

development (13), and guidance and counseling (31). Function codes 11-52, 92 and 95 encompassed all the general operating codes (Texas Education Agency AEIS Glossary, 2004, p. 15).

The TIER represented a departure from the traditional per pupil instructional expenditure variable used in numerous production function models. There were some inherent problems with using per-pupil instructional expenditures. Districts would have differing levels of purchasing power. Costs of labor might be higher due to competition for staff and higher percentages of experienced teachers. The TIER was less susceptible to these problems. However, some districts might possess characteristics that limit their capacity to allocate a greater percentage of their budget to instruction. A geographically large district might have higher transportation costs, or K-12 districts might have more construction and maintenance costs than K-6 districts. Even with these limitations, this percentage was an appropriate measure of a district's direct instructional inputs. It is important to note that the TEA Instructional Expenditure Ratio was compared against the general operating fund, and it did not include expenditures from federal entitlements or payments for bond indebtedness.

NCES Instructional Expenditure Ratio

The final predictor for this analysis was the NCES instructional expenditure ratio (NIER). This measure was similar to the TEA measure of the same name. Some important differences existed that made this measure a valid test variable. The NCES definition included only functions that were directly related to classroom activities, such as activities related to direct interaction between teachers and students (NCES Handbook, 2003). Teaching could be provided for students in a school classroom, in

another location such as a home or hospital, and in other learning situations such as those involving co-curricular activities. Teaching might also be provided through some other approved medium—such as television, radio, computer, Internet, multimedia telephone, and correspondence—that was delivered inside or outside the classroom or in other teacher-student settings. Activities of aides or classroom assistants of any type (clerks, graders, teaching machines, etc.) who assisted in the instructional process were also included in the NIER (NCES Handbook, 2003). The NIER included expenditures from local, state, and federal funds. Since Texas planned to use the NCES criteria as a guide for determining the district instructional expenditure ratio, the NCES measure was an appropriate comparison variable for this study.

Procedures for Collecting and Analyzing the Data

The majority of the data for the study was available from the TEA Website and from information requests directly to TEA. The NIER data were provided by TEA, but the calculations were made by a Texas education finance consultant, Moak, Casey, and Associates. Most of the data fields were downloaded from the TEA Website. Starting in 2003-04, the financial data changed from current budgeted to actual expenditures from the previous year. Therefore, the downloadable financial data did not align with the 2003-04 TAKS results and had to be extracted from the 2004-05 AEIS report. The following fields were downloaded from the TEA Website: district number, district name, charter, enrollment count, Panel Recommended district percent passing TAKS Reading/ELA, Panel Recommended district percent passing TAKS Math, Commended Performance TAKS Reading/ELA, Commended Performance TAKS Math, ISP, and the TIER from the 2004-05 AEIS report. Since the NIER was not available from NCES, the

data were obtained from Moak, Casey, and Associates. This company worked with Texas school districts in school finance research and planning. As part of their analyses, they had already calculated the NIER percentage for each district by using the NCES definition of instructional expenditures. The district name, number, and NIER calculation were provided in a spreadsheet format. The data were collected in an Excel spreadsheet file, then analyzed and transferred to SPPS for statistical analysis.

Data Analysis

Linear regression was the statistical method of testing for possible correlations between the criterion variables (district TAKS Reading/ELA and TAKS Math percentages at the Panel Recommended and Commended Performance level) and three predictor variables (district percentages for the Instructional Staff Percent, TEA Instructional Expenditure Ratio, and the NCES Instructional Expenditure Ratio). SPSS 13.0 was used to perform the regression calculations. Four analyses were conducted to test the null hypotheses. Analysis #1 compared the Panel Recommended TAKS Reading/ELA scores (criterion variable) to the ISP, TIER, and NIER (predictor variables). The same predictor variables were used for Analyses #2 – 4. Analysis #2 compared Panel Recommended TAKS Math scores to the predictor variables. Analysis #3 compared Commended Performance TAKS Reading/ELA results to the predictors. Analysis #4 utilized Commended Performance TAKS Math scores as the final criterion variable.

SPSS 13.0 was used to select the 483 districts from the initial 1,227 districts. Descriptive statistics were analyzed for the criterion and predictor variables. The minimum, maximum, mean, and standard deviation were reported for each of the

criterion and predictor variables. Since all of the criterion and predictor variables were

represented by percentages, all the data fields were analyzed in the raw score format.

Multiple regression is a widely used statistical technique in educational research.

It expands the functionality of the bivariate correlation by allowing a comparison of

multiple predictor variables to a single criterion variable.   The collective magnitude and

statistical significance is calculated for the collective effect of the predictors and the

individual contribution of each of the predictors. Ultimately, the regression equation

helps the researcher predict to the interaction between two or more variables (Gall et al.

2003, p. 340).

The regression equation takes the raw score form:

$$Y = b_1X_1 + b_2X_2 + \cdots b_kX_k + a.$$

The Y represents the single criterion variable, and the X_i represents one of the predictor

variables. The equation contains a regression coefficient b_i for each predictor variable,

and the a is the regression constant (Hinkle. Wiersma, & Jurs, 1998, p. 108). The

regression coefficient represents the amount of change in Y (criterion variable) when

the predictor variable changes by 1 unit. When all the predictor variables are 0, the a is

the constant, where the regression line intercepts the Y axis.   The multiple regression

equation will produce the multiple R_2. The R_2 represents the percentage of change in

the criterion variable that can be explained by the combined effects of the predictor

variables.

Selections made within SPSS produced an output file for each analysis that

included the model summary, analysis of variance (ANOVA), correlation coefficients,

and Pearson correlations. The model summary was generated to determine the overall

contribution of all the predictors when compared to the criterion variable. This test produced the Multiple R^2 and adjusted R^2 statistics. Although the research questions and null hypotheses sought to discover the individual contributions of each predictor variable, the multiple R^2 was an important statistic for determining the impact of the linear combination of all the predictor variables.

The ANOVA test was conducted in order to test the null hypotheses that the multiple correlation in the population equals zero (Hinkle, et. al., 1998. p. 486). In addition to answering the research questions, an additional purpose of the study was to determine if the null hypotheses can be rejected at the .05 alpha level. At this level, a decision to reject the null hypotheses may be incorrect 5% of the time (Hinkle et al. 1998, p. 193-194). For the purposes of this study, this was an acceptable consequence.

The Pearson-product moment correlation, sometimes referred to as the Pearson *r*, was used to determine the individual contribution of the predictor variable to the criterion variable. The Pearson *r* correlation is the average cross-product of the standard scores of two variables. The correlation coefficient is the measure of the relationship between the two variables (Hinkle et al., 1998, p. 110-111). For each predictor variable, unstandardized, standardized, standard error of the measure, *t* statistic, and the statistical significance were computed in order to test the null hypothesis for each predictor variable.

Summary

The selected methodology for the study aligned with Cameron's (2000) study that compared per-pupil expenditures to selected AEIS indicators. The criterion variables

were AEIS 2003-04 district achievement results for Panel Recommended and Commended Performance TAKS Reading/ELA and Math and the predictor variables were district-level instructional allocations percentages in 2003-04 for instructional staff and expenditures. The selected predictors were the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER).

TAKS Reading/ELA and Math were selected because they represented test results from a majority of the student population, and their high-stakes role in the Texas accountability system made them a valid predictor of student achievement. The ISP, TIER, and NIER were selected because they represented three different methods of measuring the district's efficiency in relation to instructional expenditure allocations.

In 2004, Texas collected academic and financial data on 1,227 public and charter districts. Of this population, 190 charters, were removed along with 64 non-K-12 districts. The sample was limited further to districts that have at least 1,000 students in enrollment. This was done in order to achieve a large sample, but eliminate the economy of scale problems associated with small districts. From the remaining 489 districts, six were eliminated because of incomplete data sets. Out of the initial 1,227 districts, 483 met the criteria and these were the subjects of the statistical analyses.

As with previous production function studies, multiple linear regression was the most efficient method for addressing the research questions and null hypotheses. The statistical software application, SPSS 13.0, was used to compute the correlations and statistical significance of four separate analyses. Results of these analyses and their application to the research questions are reported in Chapter 4.

CHAPTER 4

RESULTS

This study provided an analysis of the relationship, if any, between two performance levels (district Panel Recommended and Commended Performance) for TAKS Reading/English Language Arts and Math (criterion variables) and three instructional expenditure measures (Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)) (predictor variables).

Correlational statistics were used within a multiple linear regression model to test for possible relationships and statistical significance. Correlation studies generally do not lead to strong conclusions or causal relationships. However, if a significant relationship was found, it might lead to further research using an experimental research design (Gall et al. 2003). This following research questions guided this study:

1. Is there a relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

2. Is there a relationship between the AEIS base indicator TAKS Math in Texas public schools and Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

3. Is there a relationship between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (ISP), and the NCES Instructional Expenditure Ratio (NIER)?

4. Is there a relationship between the AEIS Commended Performance indicator TAKS Math in Texas public schools and the Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

This study sought to determine if any of the following null hypotheses could be rejected:

1. There is no relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the:

   a. Instructional Staff Percent (ISP)

   b. TEA Instructional Expenditure Ratio (TIER)

   c. NCES Instructional Expenditure Ratio (NIER)

2. There is no relationship between the AEIS base indicator TAKS Math in Texas public schools and the:

   a. Instructional Staff Percent (ISP)

   b. TEA Instructional Expenditure Ratio (TIER)

   c. NCES Instructional Expenditure Ratio (NIER)

3. There is no relationship between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the:

   a. Instructional Staff Percent (ISP)

   b. TEA Instructional Expenditure Ratio (TIER)

      c. NCES Instructional Expenditure Ratio (NIER)

4. There is no relationship between the AEIS Commended Performance indicator

   TAKS Math in Texas public schools and the ISP.

      a. Instructional Staff Percent (ISP)

      b. TEA Instructional Expenditure Ratio (TIER)

      c. NCES Instructional Expenditure Ratio (NIER)

     The selected sample was developed from 1,227 public or charter school districts in Texas. Of this population, 190 charter schools were removed along with 64 non-K-12 districts. The sample was limited further to districts that have at least 1,000 students in enrollment which further reduced the sample to 489 districts. This selection achieved a large sample, but eliminated the economy of scale problems associated with small districts. Six districts were eliminated because of incomplete data sets. Out of the initial 1,227 districts, 483 met the criteria, and these were the subjects of the statistical analyses. The following data were collected for the 483 school districts:

- County district number (identifier)
- District enrollment
- Charter Y/N
- K-12 Y/N
- TAKS Reading ELA percent passing (Panel Recommended)
- TAKS Reading/ELA percent Commended Performance
- TAKS Math percent passing (Panel Recommended)
- TAKS Math Commended Performance
- Instructional Staff Ratio

- TEA instructional Expenditure Ratio

- NCES Instructional Expenditure Ratio

The data in this study were collected and reported for the 2003-04 school year. The descriptive statistics of the 483 cases are shown in Table 1.

Table 1

Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
Total Enrollment	1003	211157	8234	16881
TAKS Reading/ELA	56.0	98.0	80.1	7.8
TAKS Math	35.0	96.0	65.5	10.4
TAKS CP Reading/ELA	7.0	49.0	19.5	6.4
TAKS CP Math	3.0	57.0	15.7	6.7
ISP	49.9	79.8	63.6	4.1
TIER	51.4	72.4	62.9	2.9
NIER	48	72.8	63.9	3.0

Note. n = 483

Description of Analyses

Four analyses were conducted in order to test for the null hypotheses and statistical significance. The first, hereafter referred to as "Statistical Analysis #1," used TAKS Reading/ELA as the criterion variable. The second, hereafter referred to as "Statistical Analysis #2," used "TAKS Math" as the criterion variable. The third, hereafter referred to as "Statistical Analysis #3," used "Commended Performance TAKS

(CP) Reading/ELA" as the criterion variable. And the fourth, hereafter referred as

"Statistical Analysis #4," used Commended Performance (CP) TAKS Math as the

criterion variable. All of the statistical analyses used the same predictor variables: ISP,

TIER, and NIER.

<center>Presentation of the Results</center>

The following explanations provide support for the statistical findings related to

the research questions and null hypotheses.

The Pearson-product moment correlation, sometimes referred to as the "Pearson

r", is used most often in the behavioral sciences. The Pearson *r* correlation coefficient

is the average cross-product of the standard scores of two variables. The correlation

coefficient is the measure of the relationship between the two variables (Hinkle et al.

1998, p. 110-111).

In addition to determining the existence of a relationship, the correlation

coefficient also determined the magnitude of the relationship.   The coefficient can take

on values between -1.0 and +1.0. The sign indicates the direction of the relationship.

A plus sign indicates a positive relationship, and the minus indicates a negative

relationship (Hinkle et al. 1998, p. 109). A perfect +1.0 or -1.0 correlation seldom

occurs in actual comparisons between variables. Hinkle et al. (1998) present the

following "rule of thumb" for interpreting the strength of the Pearson *r*.

- .90 to 1.00 (-.90 to -1.00) is considered a very high positive (negative)
  correlation.

- .70 to .90 (-.70 to -.90) is considered a high positive (negative) correlation.

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- .50 to .70 (-.50 to -.70) is considered a moderate positive (negative) correlation.

- .30 to .50 (-.30 to .50) is considered a low positive (negative) correlation.

- .00 to .30 (-.00 to -.30) is considered to have little if any correlation.

Evaluating the results against this standard, Statistical Analysis #1 was evaluated, and TAKS Reading/ELA scores were compared the ISP, TIER, and NIER. The following Pearson *r* values are applied to each research question. From this evaluation, the following correlational statements are presented:

- There is a low positive relationship (.317) between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the ISP.

- There is little, if any, relationship (.238) between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the TIER.

- There is little, if any, relationship (.183) between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the NIER.

Statistical Analysis #2 was evaluated, and TAKS Math scores were compared to the ISP, TIER, and the NIER. The following Pearson *r* values are applied to each research question. From this evaluation, the following correlational statements are presented:

- There is little, if any, relationship (.283) between the AEIS base indicator TAKS Math in Texas public schools and the ISP.

- There is little, if any, relationship (.268) between the AEIS base indicator TAKS Math in Texas public schools and the TIER.

- There is little, if any, relationship (.148) between the AEIS base indicator TAKS Math in Texas public schools and the NIER.

Statistical Analysis #3 was evaluated, and TAKS Commended Performance Reading/ELA scores were compared to the TEA instructional staff ratio, TEA instructional expenditure ratio, and the NCES instructional expenditure ratio. The following Pearson r values are applied to each research question. From this evaluation, the following correlational statements are presented:

- There is a low positive relationship (.318) between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the ISP.

- There is little, if any, relationship (.287) between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the TIER.

- There is little, if any, relationship (.161) between the AEIS Commended Performance indicator TAKS Reading/English Language Arts in Texas public schools and the NIER.

Statistical Analysis #4 was evaluated, and TAKS Commended Performance Math scores were compared to the ISP, TIER, and the NIER. The following Pearson r values are applied to each research question. From this evaluation, the following correlational statements are presented:

- There is little, if any, relationship (.263) between the AEIS Commended Performance indicator TAKS Math in Texas public schools and the ISP.

- There is little, if any, relationship (.295) between the AEIS Commended

  Performance indicator TAKS Math in Texas public schools and the TIER.

- There is little, if any, relationship (.089) between the AEIS Commended

  Performance indicator TAKS Math in Texas public schools and the NIER.

Multiple regression is a widely used statistical technique in educational research. It expands the functionality of the bivariate correlation by allowing a comparison of multiple predictor variables to a single criterion variable. The collective magnitude and statistical significance is calculated for the collective effect of the predictors and the individual contribution of each of the predictors. Ultimately, the regression equation helps the researcher predict the interaction between two or more variables (Gall et al. 2003, p. 340).

The regression equation takes the raw score form:

$$Y = b_1 X_1 + b_2 X_2 + \cdots b_k X_k + a.$$

The Y represents the single criterion variable, and the X_i represents one of the predictor variables.   The equation contains a regression coefficient b_i for each predictor variable, and the a is the regression constant (Hinkle et al. 1998, p. 108). The regression coefficient represents the amount of change in Y (criterion variable) when the predictor variable changes by one unit. When all the predictor variables are zero, the a is the constant, where the regression line intercepts the Y axis.   The multiple regression equation will produce the multiple R_2.   The R_2 represents the percent of change in the criterion variable that can be explained by the combined effects of the predictor variables.

In Statistical Analysis #1, R^2 = .114.   When the district TAKS Reading/ELA score is compared with the ISP, TIER, and the NIER, the predictor variables explain 11.4% of the variance in the criterion variable (see Table 2).

Table 2

Multiple Regression Analysis for Statistical Analysis #1 - TAKS Reading/ELA

Multiple Regression Analysis	Value
Multiple *R*	.338
R Squared	.114
Adjusted *R* Square	.109
Standard Error	7.363

Analysis #2 produced slightly less of a percentage with, R^2 = .108. When the district TAKS Math score is compared with the TEA ISP, TIER, and the NIER, the predictor variables explain 10.8% of the variance in the criterion variable (see Table 3).

Table 3

Multiple Regression Analysis for Statistical Analysis #2 - TAKS Math

Multiple Regression Analysis	Value
Multiple *R*	.328
R Squared	.108
Adjusted *R* Square	.102
Standard Error	9.832

Statistical Analysis #3 produced the highest R^2 value at .130. When the district

Commended Performance TAKS Reading/ELA score is compared with the ISP, TIER,

and NIER, the predictor variables explain 13.0% of the variance in the criterion variable

(see Table 4).

Table 4

Multiple Regression Analysis for Statistical Analysis #3 - Commended Performance TAKS Reading/ELA

Multiple Regression Analysis	Value
Mutiple *R*	.360
R Squared	.130
Adjusted *R* Square	.124
Standard Error	5.991

Table 5

Multiple Regression Analysis for Statistical Analysis #4 - Commended Performance TAKS Math

Multiple Regression Analysis	Value
Mutiple *R*	.349
R Squared	.122
Adjusted *R* Square	.117
Standard Error	6.301

Statistical Analysis #4 yields a similar R^2 value at .122. When the district TAKS

Commended Performance Math score is compared with the ISP, TIER, and NIER, the

predictor variables explain 12.2% of the variance in the criterion variable (see Table 5).

Statistical Significance

In addition to answering the research questions, an additional purpose of the

study was to determine if the null hypotheses can be rejected at the .05 alpha level. At

this level, a decision to reject the null hypothesis may be incorrect 5% of the time

(Hinkle et al. 1998, p. 193-194). For the purposes of this study this is an acceptable

consequence. The statistical significance is tested and reported for the four multiple

regression analyses and for each of the twelve null hypotheses.

Statistical Analysis #1

The R^2 value in statistical analysis #1 = 11.4%. The adjusted R^2 (.109) is only

slightly different from the unadjusted R^2 (.114). This finding is due to the small number

of variables, one criterion and three predictors, and the large number of cases ($n = 483$)

(Hinkle et al. 1998, p, 491).

The underlying distribution of this test statistic is the F distribution with 3 and 479

degrees of freedom. As stated previously, all of the statistical significance tests were

conducted at the .05 alpha level. Based on the test statistic (F) defined in the formula

below, $F = 20.603$:

$F =$

$$\frac{R^2/k}{(1 - R^2)/(n - k - 1)}$$

Since the computed value of F exceeds the critical value, the null hypotheses stating that there is no relationship between TAKS Reading/ELA and the predictor variables is rejected.

The probability that observed R = .338 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. Based on the *Signif F* = .000. There is a non-zero relationship in the population between the criterion variable y and the linear combination of the predictor variables x_1, x_2, and x_3 (see Table 6).

Table 6

Analysis of Variance for Statistical Analysis #1 - TAKS Reading/ELA

	df	Sum of Squares	Mean Square
Regression	3	3351.051	1117.017
Residual	479	25969.695	54.216
F = 20.603		*Signif F* = .000	

Hypotheses 1a, 1b, and 1c utilize TAKS Reading/ELA as the criterion variable. The following results are reported for each individual hypothesis.

Hypothesis 1a stated that there is no relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the ISP. The Pearson product-moment correlation reveals a correlation coefficient of .317. This coefficient indicated a low to moderate relationship between the variables (see Table 7).

At the .05 alpha level, the effect of the TEA instructional staff ratio was statistically significant, t (482) = 5.371, p = .000. Since the computed value 5.371 falls

outside the critical value, the null hypothesis, stating there is no relationship between

TAKS Reading/ELA scores and the ISP, is rejected (see Table 8).

The probability that the observed b_1 = .492 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .000. Knowledge of the ISP will enhance the prediction of TAKS Reading/ELA scores. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 1a (see Table 8).

Table 7

Pearson Correlational Data for Statistical Analysis #1 - TAKS Reading/ELA

	Y	X_1	X_2	X_3
Means	80.068	63.621	62.937	63.888
Standard deviations	7.799	4.097	2.861	2.968
Y	1.000	.317	.238	.183
X_1	.317	1.000	.426	.347
X_2	.238	.426	1.000	.539
X_3	.183	.347	.539	1.000

Note. Constant Y = TAKS Reading/ELA, X_1 = TEA Instructional Staff Ratio, X_2 = TEA Instructional Expenditure Ratio, X_3 = NCES Instructional Expenditure Ratio.

Hypothesis 1b stated that there is no relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the TIER. The Pearson product-moment correlation reveals a correlation coefficient of .238 (see Table 7). This coefficient indicated that little, if any, relationship exists between the variables.

At the .05 alpha level, the effect of the TEA instructional expenditure ratio was statistically significant, $t(482) = 2.055$, $p = .040$. Since the computed value 2.055 falls outside the critical value, the null hypothesis, stating there is no relationship between the TIER and TAKS Reading/ELA, is rejected (see Table 8).

Table 8

Coefficients fro Statistical Analysis #1 - TAKS Reading/ELA

Variable	*B*	*SE B*	*Beta*	*T*	*Sig T*
X_1	.492	.092	.258	5.371	.000
X_2	.300	.146	.110	2.055	.040
X_3	.089	.136	.034	.657	.511
Constant	24.204	8.502		2.847	.005

Note. Constant $Y =$ TAKS Reading/ELA, $X_1 =$ TEA Instructional Staff Ratio, $X_2 =$ TEA Instructional Expenditure Ratio, $X_3 =$ NCES Instructional Expenditure Ratio.

The probability that the observed $b_2 = .300$ would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .040. Knowledge of the TIER will enhance the prediction of TAKS

Reading/ELA scores. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 1b.

Hypothesis 1c stated that there is no relationship between the AEIS base indicator TAKS Reading/English Language Arts in Texas public schools and the NIER. The Pearson product-moment correlation reveals a correlation coefficient of .183 (see Table 7). This coefficient indicated that little, if any, relationship exists between the variables.

At the .05 alpha level, the effect of the NIER was not statistically significant, t (482) = 2.055, p = .511. This variable is not a significant contributor to the regression equation when used in combination with the other variables (see Table 8).

Statistical Analysis #2

The R^2 value in statistical analysis #2 = 10.8%.   The adjusted R^2 (.102) is only slightly different from the unadjusted R^2 (.108). This finding is due to the small number of variables, one criterion and three predictors, and the large number of cases (n = 483) (Hinkle et al. 1998, p. 491).

The underlying distribution of this test statistic is the F distribution with 3 and 479 degrees of freedom. As stated previously, all the statistical significance tests were conducted at the .05 alpha level. Based on the test statistic F defined in the formula below, F = 19.252:

$F =$

$$\frac{R^2/k}{(1 - R^2)/(n - k - 1)}$$

Since the computed value of *F* exceeds the critical value, the null hypotheses stating

that there is no relationship between TAKS Math and the predictor variables is rejected

(see Table 9).

The probability that the observed *R* = .328 would have occurred by chance, when

in fact the null hypothesis is true, is less than .05. Based on the *Signif F* = .000. There

is a non-zero relationship in the population between the criterion variable *Y* and the

linear combination of the predictor variables X_1, X_2, X_3 (see Table 9).

Hypotheses 2a, 2b, and 2c utilize TAKS Math as the criterion variable. The

following results are reported for each individual hypothesis.

Hypothesis 2a stated that there is no relationship between the AEIS base

indicator TAKS Math in Texas public schools and the ISP. The Pearson product-

moment correlation reveals a correlation coefficient of .283 (see Table 10). This

coefficient indicated little, if any, relationship between the variables.

Table 9

Analysis of Variance for Statistical Analysis #2 - TAKS Math

	df	Sum of Squares	Mean Square
Regression	3	5583.193	1861.064
Residual	479	46304.849	96.67
F = 19.252		*Signif F* = .000	

At the .05 alpha level, the effect of the TEA instructional staff ratio was

statistically significant, $t\,(482) = 4.370$, $p = .000$. Since the computed value 4.370 falls

outside the critical value, the null hypothesis stating there is no relationship between the ISP and TAKS Math is rejected (see Table 10).

The probability that the observed b_1 = .534 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .000 (see Table 11). Knowledge of the ISP will enhance the prediction of TAKS Math. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 2a.

Table 10

Pearson Correlational Data for Statistical Analysis #2 - TAKS Math

	Y	X_1	X_2	X_3
Means	65.462	63.621	62.937	63.888
Standard deviations	10.376	4.097	2.861	2.968
Y	1.000	.317	.238	.183
X_1	.283	1.000	.426	.347
X_2	.268	.426	1.000	.539
X_3	.148	.347	.539	1.000

Note. Constant Y = TAKS Math, X_1 =TEA Instructional Staff Ratio, X_2 = TEA Instructional Expenditure Ratio, X_3 = NCES Instructional Expenditure Ratio.

Table 11

Coefficients for Statistical Analysis #2 - TAKS Math

Variable	B	SE B	Beta	T	Sig T
X_1	.534	.122	.211	4.370	.000
X_2	.707	.195	.195	3.625	.000
X_3	-.106	.181	-.030	-.583	.560
Constant	-6.255	11.353		-.551	.582

Note. Constant Y = TAKS Math, X_1 =TEA Instructional Staff Ratio, X_2 = TEA Instructional Expenditure Ratio, X_3 = NCES Instructional Expenditure Ratio.

Hypothesis 2b stated that there is no relationship between the AEIS base indicator TAKS Math in Texas public schools and the TIER. The Pearson product-moment correlation reveals a correlation coefficient of .268. This coefficient indicated little, if any, relationship between the variables (see Table 11).

At the .05 alpha level, the effect of the TIER was statistically significant, t (482) = 3.625, p = .000. Since the computed value 3.625 falls outside the critical value, the null hypothesis stating there is no relationship between the TIER and TAKS Math is rejected (see Table 11).

The probability that the observed b_2 = .707 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .000. Knowledge of the TIER will enhance the prediction of TAKS Math. In the population, this predictor variable is a significant contributor to the

regression when used in combination with the other variables. Therefore, the results do

not support null hypothesis 2b.

Hypothesis 2c stated that there is no relationship between the AEIS base

indicator TAKS Math in Texas public schools and the NIER. The Pearson product-

moment correlation reveals a correlation coefficient of .148. This coefficient indicated

little, if any, relationship between the variables (see Table 10).

At the .05 alpha level, the effect of the NIER was not statistically significant, t

(482) = -.106, p = .560. This variable is not a significant contributor to the regression

equation when used in combination with the other variables (see Table 11).

Statistical Analysis #3

The R^2 value in statistical analysis #3 = 13.0%.   The adjusted R^2 (.124) is only

slightly different from the unadjusted R^2 (.130). This finding is due to the small number

of variables, one criterion and three predictors, and the large number of cases (n = 483)

(Hinkle et al. 1998, p. 491).

The underlying distribution of this test statistic is the F distribution with 3 and 479

degrees of freedom. As stated previously, all the statistical significance tests were

conducted at the .05 alpha level. Based on the test statistic (F) defined in the formula

below, F = 23.825:

$F =$

$$\frac{R^2/k}{(1 - R^2)/(n - k - 1)}$$

Since the computed value of *F* exceeds the critical value, the null hypotheses stating

that there is no relationship between TAKS Commended Performance Reading/ELA

and the predictor variables is rejected.

Table 12

Analysis of Variance for Statistical Analysis #3 - TAKS Commended Performance Readng/ELA

	df	Sum of Squares	Mean Square
Regression	3	2565.013	855.004
Residual	479	171189.650	35.887
F = 23.825		*Signif F* = .000	

The probability that the observed *R* = .360 would have occurred by chance, when in fact

the null hypothesis is true, is less than .05. Based on the *Signif F* = .000. There is a

non-zero relationship in the population between the criterion variable *Y* and the linear

combination of the predictor variables X_1, X_2, X_3 (see Table 12).

Hypotheses 3a, 3b, and 3c utilize TAKS Commended Performance Reading/ELA

as the criterion variable. The following results are reported for each individual

hypothesis.

Hypothesis 3a stated that there is no relationship between the TAKS

Commended Performance Reading/ELA in Texas public schools and the ISP. The

Pearson product-moment correlation reveals a correlation coefficient of .318. This

coefficient indicated a low to moderate relationship between the variables (see Table

13).

At the .05 alpha level, the effect of the TEA ISP was statistically significant, t (482) = 5.114, p = .000. Since the computed value 5.114 falls outside the critical value, the null hypothesis stating there is no relationship between the ISP and TAKS Commended Performance Reading/ELA is rejected (see Table 14).

Table 13

Pearson Correlational Data for Statistical Analysis #3 - Commended Performance TAKS Reading/ELA

	Y	X_1	X_2	X_3
Means	19.487	63.621	62.937	63.888
Standard deviations	6.402	4.097	2.861	2.968
Y	1.000	.317	.238	.183
X_1	.318	1.000	.426	.347
X_2	.287	.426	1.000	.539
X_3	.161	.347	.539	1.000

Note. Constant Y = TAKS Commended Performance Reading/ELA, X_1 =TEA Instructional Staff Ratio, X_2 = TEA Instructional Expenditure Ratio, X_3 = NCES Instructional Expenditure Ratio.

The probability that the observed b_1 = .381 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .000. Knowledge of the TEA ISP will enhance the prediction of TAKS Commended Performance Reading/ELA. In the population, this predictor

variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 3a.

Hypothesis 3b stated that there is no relationship between the AEIS base indicator TAKS Commended Performance Reading/ELA in Texas public schools and the TIER. The Pearson product-moment correlation reveals a correlation coefficient of .287 (see Table 13). This coefficient indicated little, if any, relationship between the variables.

At the .05 alpha level, the effect of the TIER was statistically significant, $t\,(482) =$ 3.777, $p = .000$. Since the computed value 3.777 falls outside the critical value, the null hypothesis stating there is no relationship between the TIER and TAKS Commended Performance Reading/ELA is rejected (see Table 14).

Table 14

Coefficients for Statistical Analysis #3 - TAKS Commended Performance Reading/ELA

Variable	B	SE B	Beta	T	Sig T
X_1	.381	.074	.244	5.114	.000
X_2	.449	.119	.200	3.777	.000
X_3	-.069	.110	-.032	-.627	.531
Constant	-28.550	6.917		-4.127	.000

Note. Constant $Y =$ TAKS Commended Performance Reading/ELA, $X_1 =$ TEA Instructional Staff Ratio, $X_2 =$ TEA Instructional Expenditure Ratio, $X_3 =$ NCES Instructional Expenditure Ratio.

The probability that the observed $b_2 = .449$ would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .000. Knowledge of the TIER will enhance the prediction of TAKS Commended Performance Reading/ELA. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 3b.

Hypothesis 3c stated that there is no relationship between the AEIS base indicator TAKS Commended Performance Reading/ELA in Texas public schools and the NIER. The Pearson product-moment correlation reveals a correlation coefficient of .161 (see Table 13). This coefficient indicated little, if any, relationship between the variables.

At the .05 alpha level, the effect of the NIER was not statistically significant, t (482) = -.069, p = .531. This variable is not a significant contributor to the regression equation when used in combination with the other variables (see Table 14).

Statistical Analysis #4

The R^2 value in statistical analysis #4 = 12.2%. The adjusted R^2 (.117) is only slightly different from the unadjusted R^2 (.122). This finding is due to the small number of variables, one criterion and three predictors, and the large number of cases (n = 483) (Hinkle et al. 1998, p. 491).

The underlying distribution of this test statistic is the F distribution with 3 and 479 degrees of freedom. As stated previously, all the statistical significance tests were conducted at the .05 alpha level. Based on the test statistic (F) defined in the formula below, F = 22.193:

$$F = \frac{R^2/k}{(1-R^2)/(n-k-1)}$$

Since the computed value of F exceeds the critical value, the null hypotheses stating

that there is no relationship between TAKS Commended Performance Math, and the

predictor variables is rejected (see Table 15).

The probability that the observed $R = .349$ would have occurred by chance, when

in fact the null hypothesis is true, is less than .05. Based on the *Signif F* = .000. There

is a non-zero relationship in the population between the criterion variable Y and the

linear combination of the predictor variables X_1, X_2, X_3 (see Table 15).

Table 15

Analysis of Variance for Statisical Analysis #4 - TAKS Commended Performance Math

	df	Sum of Squares	Mean Square
Regression	3	2643.556	881.185
Residual	479	19018.978	39.706
F = 22.193		*Signif F* = .000	

Hypotheses 4a, 4b, and 4c utilize TAKS Commended Performance Math as the

criterion variable. The following results are reported for each individual hypothesis.

Hypothesis 4a stated that there is no relationship between the TAKS

Commended Performance Math in Texas public schools and the ISP. The Pearson

product-moment correlation reveals a correlation coefficient of .263 (see Table 16). This coefficient indicated little, if any, relationship between the variables.

At the .05 alpha level, the effect of the TEA instructional staff ratio was statistically significant, t (482) = 3.896, p = .000. Since the computed value 3.896 falls outside the critical value, the null hypothesis stating there is no relationship between the ISP and TAKS Commended Performance Math is rejected (see Table 17).

The probability that the observed b_1 = .305 would have occurred by chance, when in fact null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .000. Knowledge of the ISP will enhance the prediction of TAKS Commended Performance Math. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 4a.

Hypothesis 4b stated that there is no relationship between TAKS Commended Performance Math in Texas public schools and the TIER. The Pearson product-moment correlation reveals a correlation coefficient of .295 (see Table 16). This coefficient indicated little, if any, relationship between the variables.

At the .05 alpha level, the effect of the TEA instructional expenditure ratio was statistically significant, t (482) = 5.364, p = .000. Since the computed value 5.364 falls outside the critical value, the null hypothesis stating there is no relationship between the TEA instructional expenditure ratio and TAKS Commended Performance Math is rejected (see Table 17).

Table 16

Pearson Correlational Data for Statistical Analysis #4 - TAKS Commended Performance Math

	Y_1	X_1	X_2	X_3
Means	15.683	63.621	62.937	63.888
Standard deviations	6.704	4.097	2.861	2.968
Y_1	1.000	.317	.238	.183
X_1	.263	1.000	.426	.347
X_2	.295	.426	1.000	.539
X_3	.089	.347	.539	1.000

Note. Constant Y = TAKS Commended Performance Math, X_1 =TEA Instructional Staff Ratio, X_2 = TEA Instructional Expenditure Ratio, X_3 = NCES Instructional Expenditure Ratio.

The probability that the observed b_2 = .670 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The Sig T indicates that the probability is actually .000. Knowledge of the TIER will enhance the prediction of TAKS Commended Performance Reading/ELA. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 4b.

Hypothesis 4c stated that there is no relationship between the AEIS base indicator TAKS Commended Performance Math in Texas public schools and the NIER. The Pearson product-moment correlation reveals a correlation coefficient of .089 (see Table 16). This coefficient indicated little, if any, relationship between the variables.

At the .05 alpha level, the effect of the NIER was statistically significant, t (482) = -2.520, p = .000. Since the computed value -2.520 falls outside the critical value, the null hypothesis stating there is no relationship between the NIER and TAKS Commended Performance Math is rejected (see Table 17).

The probability that the observed b_2 = -.293 would have occurred by chance, when in fact the null hypothesis is true, is less than .05. The *Sig T* indicates that the probability is actually .012. Knowledge of the NIER will enhance the prediction of TAKS Commended Performance Math. In the population, this predictor variable is a significant contributor to the regression when used in combination with the other variables. Therefore, the results do not support null hypothesis 4c.

Table 17

Coefficients for Statistical Analysis #4 - TAKS Commended Performance Math

Variable	*B*	*SE B*	*Beta*	*T*	*Sig T*
X_1	.305	.078	.187	3.896	.000
X_2	.670	.125	.286	5.364	.000
X_3	-.293	.116	-.130	-2.520	.012
Constant	-27.208	7.276		-3.739	.000

Note. Constant Y = TAKS Commended Performance Math, X_1 =TEA Instructional Staff Ratio, X_2 = TEA Instructional Expenditure Ratio, X_3 = NCES Instructional Expenditure Ratio.

Summary

The analyses were conducted in order to test for a relationship between selected Academic Excellence Indicator System variables, Panel Recommended TAKS Reading/ELA and Math, Commended Performance TAKS Reading/ELA, and Math and measures of instructional expenditures, TEA Instructional Staff Ratio (ISP), TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER). Of the twelve null hypotheses, nine were rejected. A significant non-zero relationship was found in all tests with the predictors ISP and the TIER and one test with the NIER predictor (see Table 18).

The Pearson r was calculated for each of the predictors. A low to moderate, statistically significant relationship was found for Panel Recommended TAKS Reading/ELA (.317) and Commended Performance TAKS Reading/ELA (.318) and the ISP. The ISP demonstrated statistically significant values of .283 for Panel Recommended TAKS Math and .263 for Commended Performance TAKS Math predictors. This result indicated little, if any, relationship between Panel Recommended TAKS Reading/ELA and Commended Performance Math, and the ISP (see Table 18).

The following multiple regression coefficients were calculated for each of the four analyses: Panel Recommended TAKS Reading/ELA (.114) and TAKS Math (.108), and Commended Performance TAKS Reading/ELA (.130) and TAKS Math (.122). These effect sizes were statistically significant at the .05 alpha level. These findings indicate little, if any, relationship between the criterion variables and the combined interaction of the predictor variables. However, the null hypothesis was rejected for each of the four

analyses because a statistically significant non-zero relationship existed between the

criterion variables and the combined interaction of the predictor variables.

Table 18

Summary of Pearson Correlations

Analyses 1-4	ISP	TIER	NIER
TAKS Reading/ELA	.317*	.238*	.183
TAKS Math	.283*	.268*	.148
TAKS CP Reading/ELA	.318*	.287*	.161
TAKS CP Math	.263*	.295*	.089*

Note. *Statistically Significant at the .05 level

The Pearson *r* values for the TIER were all statistically significant at the .05 level.

The correlations ranged from .238 for Panel Recommended TAKS Reading/ELA and

.295 for Commended Performance TAKS Math. These findings indicated, little, if any

relationship between the TIER and the criterion variables. The NIER demonstrated one

statistically significant correlation (.089) when compared to Commended Performance

TAKS Math. This finding indicated little, if any, relationship between the NIER and the

criterion variables.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The study was conducted during a time of intense criticism of the efficiency of public elementary and secondary schools. Per-pupil expenditures had continually increased, and schools were demanding more resources to meet the requirements of high-stakes accountability. In spite of the trend of increased per-pupil costs, the overall percentage of the educational dollar had remained constant at approximately 60% for the past several decades (Hanushek & Rivkin, 1997; Skandera & Sousa, 2003). The general conclusion was that schools were not using the current resources in an effective manner.

From this debate over the schools' ability to efficiently allocate funding resources, the creation of a minimum benchmark for instructional allocations gained acceptance as a way to mandate efficiency. Proponents of this input policy claimed that reallocating the existing funds to instruction would effectively increase funding without increasing the overall costs of education. The 65% Solution was developed by Tracey Mooney, an Arizona Republican political consultant. To disseminate the idea Patrick Byrne (2005), through his Website www.firstclasseducation.org, launched a nationwide campaign for all 50 states to pass a law requiring every school district to spend 65% of its educational operating budgets in classrooms for the benefit of children. Subsequently, Texas Governor Rick Perry mandated a 65% instructional allocation requirement to all Texas school districts (Hoppe, 2005).

Education production function research is a common method for estimating the impact of inputs on desired productivity. Production function studies have produced a mixture of findings. Numerous studies have been conducted utilizing various input and outcome measures such as test scores, student to ratios, teacher experience, teacher quality, and per-pupil expenditures. Childs and Shakeshaft (1986) and Hanushek (1986, 1996) conducted extensive meta-analyses of the production function research. Their findings generally supported the findings of the Coleman Report (1966) that there was no systematic link between educational resources and outcomes. However, Childs and Shakeshaft found evidence of a positive relationship between district-level instructional costs and student achievement. Cameron (2000) found very little relationship between per-pupil expenditures and student achievement in her analysis of per-pupil expenditures and selected AEIS indicators for Texas school districts.

Other research has indicated findings supporting the impact of resources on student achievement. Hedges and Greenwald's (1996) findings provided a counterpoint to Hanushek's conclusions (1986, 1996). By revising the universe of subjects presented by Hanushek (1996), Hedges and Greenwald concluded that resources were systematically related to student achievement. Wendling and Cohen's (1981) study found that differences in teacher quality, class size, and instructional expenditures were related to student achievement. Ferguson (1991) studied almost 900 Texas school districts and found that differences in school quality (teacher qualifications, class size) accounted for between one quarter and one third of the variation in student test scores. Cooper et al. (1994) came to similar conclusions and summarized that money does matter as along as the resources reach schools, classrooms, teachers, and students.

Wenglinsky (1997) concluded that increasing instructional per-pupil expenditures to lower class size ratios and increase administrative support improved the social environment, which resulted in improved student performance.

There is little research comparing instructional allocation ratios to student achievement. Standard & Poor's (2006) conducted a study to compare selected student performance outcomes to the 65% Solution", or NIER. Standard & Poor's found that little, if any, relationship existed between (R^2 values between .008 to .163) the NIER and student achievement measures from selected states that either had or were considering the 65% Solution.

This study extended decades of previous research in the area of educational production function and produced new findings by incorporating relevant new variables. The introduction of new measures of inputs, such as the Instructional Staff Percent (ISP), the TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure Ratio (NIER), also known as the 65% Solution, provided new variables that were not previously available for production function research. All three of these measures represented a level of instructional resource allocation. However, each one possessed considerable differences in their representation of instructional inputs. Both the ISP and the TIER included allocations in four areas: classroom instruction, guidance and counseling, instructional professional development, and instructional media services (library). The NIER only includes expenditure allocations applied to classroom instruction, and does not include the guidance and counseling, instructional professional development, or instructional media services.

In addition to the previously mentioned inputs, the evolution of state accountability systems led to the development of comprehensive high-stakes testing linked to school district performance evaluations. During 2003-04, Texas assessed over 80% of its students in reading and mathematics through the Texas Assessment of Knowledge and Skills (TAKS) testing program. Texas established a minimum passing standard, Panel Recommended, and a higher performance standard, Commended Performance, in order to evaluate the overall district effectiveness at teaching the curriculum. The Commended Performance standard provided a new variable for estimating the impact of the previously mentioned instructional inputs to higher levels of student achievement.

Financial and student performance data were collected, and a performance rating label was then applied to campuses and districts based on TAKS performance, along with other school performance indicators. The comprehensive coverage of the assessment and the established minimum and high performance standards, along with the previously discussed instructional resource measures, provided the variables for this production function study.

This study utilized a linear regression model to analyze the relationship between student performance outcomes in reading and math (criterion) and three different measures of instructional expenditure allocations (predictor). Texas K-12 school districts that reported financial and student performance results in 2003-2004 were the object of analysis. The sample was developed from a population of 1,227 Texas school districts that reported financial and student performance data for 2003-04. The sample was limited to K-12 public (not charter) districts with at least 1,000 enrolled students.

The minimum enrollment limitation was done in order to eliminate the statistical

abnormalities commonly associated with smaller districts. After removing 190 charter

schools, 64 non-K-12 districts, 484 districts with less than 1,000 students in enrollment,

and 6 districts with incomplete data sets, the final analysis sample contained 483

districts.

Since the predictor variables are somewhat unique and new to production

function research and due to the need for a large representative sample, no further

limitation for district characteristics (economically disadvantaged, ethnicity, wealth,

enrollment) were considered for this analysis. However, the additional findings section

of this chapter will offer some important conclusions regarding the impact of district

characteristics as related to these predictors. The statistical software package, SPSS

13.0, was used to conduct four analyses in order to answer the following research

questions:

1. Is there a relationship between the AEIS base indicator TAKS Reading/English

    Language Arts in Texas public schools and the Instructional Staff Percent (ISP),

    TEA Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure

    Ratio (NIER)?

2. Is there a relationship between the AEIS base indicator TAKS Math in Texas public

    schools and Instructional Staff Percent (ISP), TEA Instructional Expenditure Ratio

    (TIER), and the NCES Instructional Expenditure Ratio (NIER)?

3. Is there a relationship between the AEIS Commended Performance indicator TAKS

    Reading/English Language Arts in Texas public schools and the Instructional Staff

Percent (ISP), TEA Instructional Expenditure Ratio (ISP), and the NCES

Instructional Expenditure Ratio (NIER)?

4. Is there a relationship between the AEIS Commended Performance indicator TAKS

   Math in Texas public schools and the Instructional Staff Percent (ISP), TEA

   Instructional Expenditure Ratio (TIER), and the NCES Instructional Expenditure

   Ratio (NIER)?

The following null hypothesis statements guided the analyses:

1. There is no relationship between the AEIS base indicator TAKS Reading/English

   Language Arts in Texas public schools and the:

   a. Instructional Staff Percent (ISP)

   b. TEA Instructional Expenditure Ratio (TIER)

   c. NCES Instructional Expenditure Ratio (NIER)

2. There is no relationship between the AEIS base indicator TAKS Math in Texas

   public schools and the:

   a. Instructional Staff Percent (ISP)

   b. TEA Instructional Expenditure Ratio (TIER)

   c. NCES Instructional Expenditure Ratio (NIER)

3. There is no relationship between the AEIS Commended Performance indicator

   TAKS Reading/English Language Arts in Texas public schools and the:

   a. Instructional Staff Percent (ISP)

   b. TEA Instructional Expenditure Ratio (TIER)

   c. NCES Instructional Expenditure Ratio (NIER)

4. There is no relationship between the AEIS Commended Performance indicator

    TAKS Math in Texas public schools and the ISP.

    a. Instructional Staff Percent (ISP)

    b. TEA Instructional Expenditure Ratio (TIER)

    c. NCES Instructional Expenditure Ratio (NIER)

Findings

The results of the analyses support several overall findings. First, little, if any,

relationship (R^2 values from .108 to .130) was demonstrated by the collective interaction

of the ISP, TIER, and NIER and district TAKS Reading and Math results at the Panel

Recommended or Commended Performance levels. Second, the individual contribution

of the predictor variables, ISP and TIER, demonstrated a consistent, statistically

significant, positive (Pearson r ranges from .238 to .318) interaction with the criterion

variables. Third, the individual contribution of the NIER predictor variable demonstrated

the least influence (Pearson r from .089 to .183) on TAKS Reading/ELA and Math

achievement. Of the four analyses, the NIER result was statistically significant at the

.05 level for one test out of four. And finally, the evidence did not show that any of the

predictors influenced higher levels of student achievement, Commended Performance,

than the Panel Recommended (minimum) TAKS performance standards.

The multiple regression coefficients were calculated to test the magnitude of the

correlation, if any, between the criterion variable and three predictor variables. This

study utilized three similar measurements for instructional inputs as predictors. Since

very little research has been conducted on the impact of instructional expenditure ratios,

the multiple regression coefficients were calculated to test the impact of multiple

measures of instructional inputs. Because the ISP, TIER, and NIER possess

overlapping definitions, the regression coefficients were not expected to produce

substantial interaction effects. The regression equation was used for efficiency and for

testing the overall effect of instructional ratio measurements.

In support of the first finding, R^2 values ranged from a low .108 for TAKS Math to

the highest of .130 for Commended Performance TAKS Reading/ELA. This means the

collective contributions of all the predictors were responsible for 11 to 13% of the

variance in District TAKS scores. The regression coefficients were much lower than the

Pearson r effect sizes. Because of the overlapping definitions of the instructional ratio

constructs, the regression effect sizes were not as important as the individual results for

each predictor. These effect sizes conformed as expected and aligned with Cameron's

(2000) study comparing total and administrative per-pupil expenditures to selected AEIS

indictors in Texas school districts. Cameron reported R^2 values from two analyses at

.060 to .141. Childs and Shakeshaft (1986) reported similar results in their meta-

analysis of production function studies with correlations ranging from 1 to 9%.

The individual contribution of each predictor produced findings with statistically

significant Pearson r correlation values ranging from a low .089 for the NIER

relationship to TAKS Math and a high of .318 for the ISP's relationship to Commended

Performance TAKS Reading. Of the twelve Pearson r values, 100% were a statistically

significant positive for the predictors, ISP and TIER. Only one out of four was

statistically significant for NIER. The Pearson r values fell between .238 and .317 for

the ISP and TIER, and the NIER produced one statistically significant correlation of .089

for Commended Performance TAKS Math. According to Hinkle et. al (1998, p. 109),

Pearson correlation values less than .30 represent little, if any, practical correlation. However, it should be noted that the ISP demonstrated a low moderate correlation (.317 and .318) to TAKS Reading/ELA for the Panel Recommended and Commended Performance standards. All of the statistically significant findings were positively correlated. This evidence supports the conclusions from Hedges and Greenwald's (1996) meta-analysis of production function studies in that a systematic relationship between resources and student achievement do exist.

The impact of the individual predictors, ISP and TIER, generally met the expected assumptions. These variables represent a collection of instructional inputs (class size, teacher experience, teacher salary, professional development, teacher education, instructional support) previously found to show a positive impact on student achievement. Therefore, they should be expected to demonstrate a consistently positive relationship. Numerous research studies have found consistent relationships between instructional inputs and student achievement (Childs & Shakeshaft, 1986, Ferguson, 1991, Cooper et al., 1994, Wenglinsky, 1997, Murnane, 1996, Harter, 1998, Grissmer et al. 2000, Malone, 2000, Fermanich, 2003)

The impact of the NCES Instructional Expenditure Ratio (NIER), or 65% Solution, supported the conclusions of Standard & Poor's (2006) analysis of the NIER when compared to student reading and math performance in selected states in the U.S. Pearson correlations ranged from a low .0008 in Minnesota to .1683 for Florida (Standard & Poor's, 2006, p. 11-15).

And finally, did differences in instructional inputs influence higher levels of student achievement? In this study, Commended Performance on TAKS Reading/ELA

and Math were used as measurements of higher achievement. Little, if any research is available regarding the impact of resources on higher levels of student performance. The Pearson correlations are similar for both TAKS Reading/ELA and Math. For the predictor ISP, TAKS Reading/ELA had an almost identical Pearson correlation (.317) to the Commended Performance correlation (.318). For TAKS Math, the Pearson correlation with the ISP was .283 compared to .263 for Commended Performance. For the TIER, TAKS Math showed a correlation of .268 compared to .295 for Commended Performance. The results indicated little, if any, differences in minimum or higher levels of student achievement based on differences in instructional expenditure ratios.

Conclusions

This study produced three conclusions of practical application to educational leaders and policy-makers that are considering a minimum instructional allocation requirement. First, the instructional expenditure measures, ISP and TIER, that include other instructional services to include instructional staff development, curriculum development, guidance and counseling, instructional media services, consistently demonstrated a positive relationship to student performance on TAKS Reading/ELA and Math. Several researchers have found similar correlations to student achievement in these peripheral instructional support areas (Moore, 1984; Murnane & Levy, 1996; Stegmaier Nappi, 1997; Fermanich, 2003).

The NCES Instructional Expenditure Ratio (NIER), or 65% Solution, did not produce any evidence that this minimum instructional spending threshold, applied uniformly, will improve student achievement. In fact, the findings of this study indicated the NIER to be an insignificant predictor of student reading and math achievement. As

many others have found, this is not to say additional resources to classroom activities will not improve student performance. It only indicates that the NIER did not show to have a significant impact on student test scores.

Since there were little, if any, differences in the correlation coefficients between the Panel Recommended and Commended Performance analyses, the findings conclude that variations in instructional inputs as represented by the ISP and TIER did not relate to variances in higher levels of student achievement. Therefore, the impact of instructional resource differences had the same affect on the Panel Recommended or Commended Performance results.

The 65% Solution has several flaws. First, it assumes that all schools are adequately funded. Yet, decades of litigation have continued to address funding equity and adequacy as a result of continued differential spending between poor and wealthy districts. Some would also claim that public education spending has not kept up with inflation. Regardless of the direction of this argument, it can be assumed that some schools are not adequately funded. Therefore, under-funded schools and districts would not have the capacity to generate adequate instructional funds by reallocating non-instructional funds into the classroom.

The 65% Solution has definition problems. The definition includes expenditures for extra-curricular programming and field trips, but excludes expenditures for instructional professional development and testing. Both areas, instructional professional development and testing, have a direct connection to accountability requirements in the No Child Left Behind Act. Students must show academic progress through high-stakes testing, and teachers must be highly qualified. As stated by Bracey

(2006): "The 65% Proposal advocates act as if the various state Supreme Court adequacy decisions and concerns expressed in standards-based reform do not exist" (p. 16).

As it has been demonstrated repeatedly, narrowly defined input-based policies seldom become the solution for what works to improve student achievement. Money does matter, as long as it is efficiently applied and productively utilized through a variety of carefully integrated instructional strategies, including smaller class sizes, quality teachers, targeted professional development, quality materials, and quality student support. Funding allocation controls need to occur at the school level with district oversight and support. Schools need to keep their focus on student improvement (outputs) and have the autonomy to allocate resources that have the greatest potential to serve students. With the diversity that exists in public elementary and secondary schools, a "one-size-fits all" solution, such as the 65% Solution, has little hope for improving student performance.

<div align="center">Recommendations</div>

If the core purpose for a minimum standard for instructional allocations is to improve student achievement, then the NIER has not shown a link to this purpose. It is clear from the findings of this study that other established measures, the ISP and the TIER, which include instructional professional development, library services, and guidance and counseling, demonstrated a consistent and positive relationship to student achievement in math and reading.

If an instructional allocation benchmark is an inevitable accountability requirement for school districts, a definition of instructional inputs supported by the

<div align="center">95</div>

research literature, must be developed by policy-makers and school leaders. Otherwise, the benefits of the 65% Solution are political, not educational. In fact, before the conclusion of this study, Texas had already proposed a modification to the NIER formula by adding library services as an instructional expenditure category (Texas Education Agency Commissioner's Rules, 2006).

Examining how the most resource-effective districts (high achievement at low cost) allocate instructional resources could help in the development of an effective instructional resource standard (Standard & Poor's, 2006). Schools and school districts should examine the research literature to determine which combination of inputs has the most effective link to student achievement and allocate funds to achieve the desired outputs. Accountability systems were designed to establish standards, assessment and consequences, while allowing the local school or school district the flexibility to allocate resources to meet accountability standards.

Educational leaders and policy-makers need to hold schools accountable for the use of fiscal resources and the performance of students. However, a mandate on inputs would seem to be a regressive reform effort (Bracey, 2006). In recent years, reform efforts have focused on outputs and providing more control at the school-level. The 65% Solution is a district-level requirement based entirely on inputs. Finding a measure that is immune to regional cost differences and the inequities within per-pupil expenditures is a major challenge. Districts have different needs and may need to apply resources in non-instructional areas. The decline in social capital may require additional funding in support areas not directly related to instructional activities (Hedges & Greenwald, 1996). Therefore, an input-based policy, such as the 65% Solution, must

consider the total support needs of diverse districts in order to be an effective

accountability measure. Non-instructional support services do not exist dichotomously

apart from instructional services. Educational services are systematically linked.

Changes in one area will impact other areas.

<div align="center">Recommendations for Further Research</div>

The continued focus on public school efficiency and the introduction of new

methods to benchmark efficiency should cause an increase in related research studies.

The research method from this study needs to be replicated on a larger scale with

clusters of subjects, at the school or district level, that possess similar characteristics.

The impact of differential instructional staffing and budgetary benchmarks on districts of

similar wealth, student demographics, and enrollment would be of particular importance.

By using new benchmarks for instructional expenditure measurements, the

research on the long-term influence of higher instructional allocations could be

extended. By evaluating incremental increases in instructional expenditure ratios over a

period of several years could lead to stronger conclusions regarding the impact of

instructional expenditure inputs.

Additional studies should be conducted on the allocation of resources in the

areas of instructional professional development, library and media services, and

guidance and counseling. For example, a multiple linear regression analysis comparing

the spending categories that make up the TIER (teachers, library media services,

instructional professional development, and guidance and counseling) to selected

district student performance measures, would provide additional insight into the

collective and individual contributions of these educational inputs.

Summary

This study sought to discover a relationship, if any, between selected AEIS indictors (TAKS Reading/ELA and TAKS Math), and selected instructional allocation measurements (Instructional Staff Percent, Texas Instructional Expenditure Ratio, NCES Instructional Expenditure Ratio) in Texas public schools. A second goal of this study was to discover a relationship, if any, between these variables and higher levels of student achievement.

For decades, per-pupil expenditures have consistently increased, yet the portion of the public education dollar directed to instructional activities has remained at approximately 60% (Hanushek & Rivkin, 1997). Public school effectiveness has been criticized for an apparent lack of proportional achievement gains since the 1966 release of the Coleman Report and *A Nation at Risk* (1983) (Peterson, 2003). In response to this trend, stakeholders and policy-makers have demanded that schools be more accountable for their fiscal efficiency and student achievement. Advocates for fiscal efficiency developed a new input-based reform known as the 65% Solution. This political initiative called for every state in the U.S. to pass a law that would require a minimum of 65% of the education dollar to be directed to instructional activities. The definition of instructional activities, as defined by NCES, included all teaching activities that involved interaction between teachers and students including classroom, extra-curricular activities and field trips. However, activities, such as instructional professional development, library services and student support were considered non-instructional

activities. This was one of he more controversial issues with the 65% Solution (Bracey, 2006).

Although many production function studies have been conducted over the past few decades, little research existed on the impact of instructional expenditure ratios on student achievement. The advent of the 65% Solution, along with the wealth of relevant variables that were available from Texas, made this study timely and significant.

In the 2003-04 school year, Texas reported assessment results for over 80% of its student population in TAKS Reading/ELA and TAKS Math. In addition to the minimum district-level passing percentage (Panel Recommended), Texas reported a higher achievement standard known as Commended Performance. In addition to the TAKS results, Texas reported two financial indicators related to fiscal efficiency, the Instructional Staff Percent (ISP) and the Instructional Expenditure Ratio (TIER). The ISP and TIER were valid comparison variables because their definition included instructional activities that were excluded from the 65% Solution. For example, the ISP and TIER exclude extra-curricular activities, but include library services, instructional professional development, and guidance and counseling.

With the addition of the NCES Instructional Expenditure Ratio (NIER), or 65% Solution, four multiple linear regression analyses were conducted on a sample of 483 Texas Districts. The sample was limited to districts that served grades K-12 and had enrollments greater than 1,000 students.

The analyses produced generally expected results. In most instances, there was little, if any, relationship between TAKS Reading/ELA and TAKS Math, and the ISP, TIER, and NIER. However, a low to moderate relationship was discovered in the

comparison of TAKS Reading/ELA, and the ISP and TIER. This result was the same for both the Panel Recommended and Commended Performance. In every instance, the ISP and TIER showed positive, statistically significant, relationships to TAKS results. The NIER had the lowest correlation and was statistically insignificant in three out of four analyses.

As shown by Standard & Poor's (2006), the 65% Solution has shown little, if any, relationship to student achievement. The findings of this study suggest that other established measures, the ISP and the TIER, which include instructional professional development, library services, and guidance and counseling, demonstrated a consistent and positive relationship to student achievement in TAKS Reading/ELA and TAKS Math. This would support the argument that inputs other than direct teacher-to-student interaction may help explain differences in student performance. This study demonstrated that variations in the types and amounts of instructional resources have shown a relationship to student achievement. If a minimum level of instructional allocation is mandated, the findings of this study should help policy-makers and school leaders establish a definition of instructional activities with the strongest link to student performance.

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