SCHOOL RESOURCE ALLOCATION IN TEXAS PUBLIC SCHOOLS: STUDY OF HIGH-POVERTY, HIGH PERFORMING SCHOOLS AND HIGH-POVERTY, LOW PERFORMING SCHOOLS

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Dissertation Prepared for the Degree of

DOCTOR OF EDUCATION

UNIVERSITY OF NORTH TEXAS

May 2009

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The purpose of this study was to examine the relationship between resource allocation practices in specific categorical functions and student performance in reading and math. This study utilized quantitative research methods to study the effects of spending and performance over four years of analysis. Quantitative data was acquired utilizing information from the Texas Education Agency. The data was collected from 81 campuses and represented over 1,500 students. The study’s outcomes reported that little or no correlation could be found between inputs (dollars spent in three categories) and outputs (student results in reading and math). However, subgroup analysis revealed that students from non-low socioeconomic (SES) households started out higher than their low SES counterparts, and low SES students performed worse over time in both reading and math. Math results decreased more dramatically than reading indicating a need for school-level training in data analysis to ensure that limited dollars are spent appropriately. The study recommends that principals and school administrators be especially knowledgeable in critical data analysis skills. The study further recommends that state policy-makers invest more heavily in early math instruction. In addition, the current study found that student achievement, in low-SES students, especially in mathematics is very alarming. Low SES students are starting out behind the non low-SES counterparts and perform progressively worse over time. State policy makers must address these concerns.
ACKNOWLEDGEMENTS

The writing of this dissertation has been one of the most significant academic challenges I have ever had to face. Without the support, patience and guidance of the following people, this study would not have been completed. It is to the following people that I owe my deepest gratitude.

My family: Thank you Scout, Tate and Emma. You were always supportive. Your patience and encouragement will always be important to me. I love you all very much. Without the support of my wife, Oteka, this would not have been possible. Your love and support (and occasional prodding) kept me going. Your love is most important.

My parents: Mom and Dad, I appreciate your patience and support. More than one family get together had to be shortened or modified to work around my schedule. I also greatly appreciate your instilling the power of education in all three of your sons. The strong work ethic that I possess is because of you. I am also glad that Pop made it through recent health concerns to see all three sons with a doctorate.

My brothers, Guy and Grant: By completing your doctoral programs you showed me that one can complete the highest level of academic achievement. I appreciate your words of encouragement and understanding.

My colleagues at work: You were all so very understanding and empathetic. Your words of encouragement and patience will always be appreciated.

My doctoral cohort: The collegiality and support for each other was extremely important and the bonds established in this process will last a lifetime.

Judi Cangas: You deserve special recognition for your patience and understanding. You were so supportive of me during this trying process.
Dr. Camp and Dr. Byrd: Thank you for your guidance as co-major professors to this project.

Dr. John Brooks: Thank you for your support and encouragement throughout this process. Your support will always be important to me.

Dr. Grant Simpson: Thank you for your support on this project and throughout my career.
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CHAPTER 1
INTRODUCTION

Sound funding for public education is of paramount concern to any governmental institution concerned with the enhancement of its human capital. Since Serrano v. Priest, (1971), state and local governmental institutions throughout the nation, have grappled with matters related to the adequate and equitable funding of public education. The federal courts in Serrano v. Priest (1971) and subsequent cases in states throughout the nation, state that education is a function of the states, and as such, states must take responsibility for it, not the federal government. As a result of this shift in responsibility, school boards and administration have been perpetually involved in debate with state legislators regarding school funding formulas. To exacerbate the complexity of this situation, many local education agencies continued to file suit against their respective states in order to secure what they perceive to be a sufficient amount of state effort in ratio to total dollars spent. The State of Texas dealt with the issue of adequate funding several times since the Serrano decision in 1971. A series of court battles have raised public education funding as well as this primary debate in most every legislative session since 1971. The perennial debate has drawn out any number of reports, studies and research attempting to address the question, Does money matter? (Coleman, 1966; Hanushek, 1996).

Some research studies indicated that higher per pupil expenditures have had a positive affect on achievement (Childs & Shakeshaft, 1986; O’Neil, 1994; Lohman, 1999; Greenwald, Hedges & Laine, 1994 & 1996). Other studies, however, have shown that per pupil expenditures have had little affect on student achievement (Hanushek,
1989, 1994, 1996 & 1997; Walberg, 1998; Coleman, 1966). These studies have been cited by various institutions in the state of Texas to support their respective positions. The purpose of this study was to use a relatively new student growth analysis to explore potential relationships between per student expenditures and student growth.

Some previous studies have attempted to explore achievement and per pupil spending correlations at the state-wide level of spending. An Arkansas study by Klingele and Warrick (1990) found that data indicated the relative wealth of schools has a statistically significant correlation to positive fourth grade reading scores. A Massachusetts study by Gaudet (1994), however, indicated that other factors impacted student outcomes as much as spending. Ciotti (1998) noted that even with all the mixed results of research, there were still many convinced that spending did make a difference. To reinforce this position, he noted that federal judges in Missouri and California have included in their federal desegregation plans that schools must devise a cost is no object education plan.

Pan (2004) concluded that even when there was a lack of purposeful planning in resource allocation, as long as more resources were dedicated towards student instruction, there was a positive effect on student outcomes. This study did not however, take into consideration the relative difference of the composition of student demographics. The purpose of the study was to evaluate similar resource allocation concerns, yet in a way that carefully considers the question of whether allocation practices have had a greater impact, either positive or negative on students living in households of low socioeconomic status.

Since the current study was primarily concerned with analysis of resource
allocation practices and the impact on students in Texas, it was important to consider the shifting make up of the students in the state. One expert in such analysis is Dr. Steve Murdoch, state demographer. In his 2002 report, *Population Change in Texas*, Murdoch laid out a careful analysis of population trends based on Census Bureau data. According to Murdoch, the 2005 U.S. Census Bureau information stated that Texas had the fifth highest percentage of people living in poverty (17.6%). For these purposes, poverty was defined as an income of $19,806 or less for a family of four or $9,973 or less for an individual. In addition, according to the same report, Texas had the fifth highest child poverty rate (24.9%) in the nation.

In 2005, the National Assessment of Education Progress (NAEP) assessment reported that Texas had the sixth highest percentage (48%) of eighth grade students on free and reduced lunch programs, only ahead of Mississippi, New Mexico, Louisiana, Alabama and Oklahoma (Nation’s report card, 2005). In addition, the 2005 Academic Excellence Indicator System (AEIS), regulated by the Texas Education Agency (TEA), showed that 51% of Texas students qualified for free and reduced lunch programs (Texas Education Agency, AEIS Report, 2005). All of these measurements used different formulas to establish the definition of *poor*; however, all indicated that Texas has one of the highest percentages of students from households considered low socioeconomic. For this study, the TEA definition incorporating the use of free and reduced lunch qualification was utilized.

Murdoch’s work was important, not only in reporting where Texas currently ranks in the nation but was also significant in its prediction of where the state will be headed in coming decades. According to his 2002 report, there will be dramatic change and
growth in Texas in coming years. The report explained trends from 1990-2000 in which the total population of Texas increased from 16,986,510 to 20,851,820, a 27% increase. He noted the following changes within the total growth between 1990 and 2000:

- Anglos increased by 7.6%;
- African Americans increased by 22.5%;
- Hispanics increased by 81.2%;
- Other ethnicities increased by 53.7%;
- Generally, there was a migration from rural areas in Texas to the cities and suburbs (Murdoch, 2002).

In 2005, Anglos in Texas were outnumbered for the first time by all other ethnic groups. Murdoch forecasted that the Hispanic subgroup will become more than 40% of the state’s population by 2040 (Murdoch, 2002). Perhaps some of Murdoch’s most sobering predictions related to the undereducating of our populace in which he noted that according to the American Community Survey, African American and Hispanic populations in Texas completed college at rates significantly below that of their Anglo counterparts. Given the projected growth in non-Anglo subpopulations in Texas, the educational achievement of these two groups in particular must rise substantially to avoid a decline in the overall educational level of the whole state. Table 1 was referenced in Murdoch’s report, and demonstrated the vast disparity between high school completion and college completion among certain populations of Texas (Murdoch, 2002).
Table 1

2004 Education Achievement Levels of Texas 25 Year-olds

<table>
<thead>
<tr>
<th></th>
<th>High School Completion</th>
<th>College Completion</th>
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<tbody>
<tr>
<td>White</td>
<td>90%</td>
<td>33%</td>
</tr>
<tr>
<td>African American</td>
<td>83%</td>
<td>20%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>55%</td>
<td>11%</td>
</tr>
<tr>
<td>Other</td>
<td>65%</td>
<td>21%</td>
</tr>
</tbody>
</table>

Note. American Community Survey, 2004

In response to these data, the Texas Higher Education Coordinating Board (THECB, 2005) adopted an initiative named Closing the Gaps. The goal of the initiative was to increase college participation and success, strengthen public college and university programs, and expand funded research in higher education institutions; while specifically increasing higher education participation of African American and Hispanic subpopulations.

Table 2

Annual College Enrollment - Texas (Public and Private Schools)

<table>
<thead>
<tr>
<th></th>
<th>Fall 2000</th>
<th>Fall 2004</th>
<th>Change from 2000 to 2004</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>African American</td>
<td>108,463</td>
<td>138,254</td>
<td>29,791 27.5%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>237,394</td>
<td>309,339</td>
<td>71,945 30.3%</td>
</tr>
<tr>
<td>White</td>
<td>570,042</td>
<td>630,807</td>
<td>60,765 10.7%</td>
</tr>
<tr>
<td>Total</td>
<td>915,899</td>
<td>1,078,400</td>
<td>162,500 168.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2004 (under) and/or over 2005 target</th>
<th>2005 target</th>
<th>% of 2005 target achieved</th>
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<tbody>
<tr>
<td>African American</td>
<td>6,254</td>
<td>132,000</td>
<td>126%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>(30,661)</td>
<td>340,000</td>
<td>70.1%</td>
</tr>
<tr>
<td>White</td>
<td>39,807</td>
<td>591,000</td>
<td>289.9%</td>
</tr>
<tr>
<td>Total</td>
<td>38,881</td>
<td>1,169,000</td>
<td>486.0%</td>
</tr>
</tbody>
</table>

Note. Texas Higher Education Coordinating Board Annual Report, 2005
Table 2 reflects the THECB status report regarding the goals. As demonstrated, total goals have been met. In addition to total goals being met, African American and White exceeded goals by 126% and 289.9%; However, Hispanic students failed to reach goals by 29.9%. This information could prove to be important to Texas as it considers future investments in public education.

Many state-wide associations have supported the THECB goals. One of the most notable groups is the Texas Business and Education Coalition [TBEC] (2006). In a position paper written by John Stevens, Executive Director of TBEC, he stated that the adverse economic and social consequences of an undereducated population are unacceptable (TBEC, 2006). He continued to explain that investments to improve the educational levels of the historically underserved segments of the population and strengthen the education of all Texas students would pay dividends in terms of a vibrant and competitive future economy for all Texans. According to Stevens, delaying these investments would only compound the challenges and increase future cost statewide (TBEC, 2006).

Whereas the college attendance rates are not the subject of the current study, they are important because they relate to secondary questions and concerns regarding investments in public education (PK-College). As the growth rates of traditionally high-poverty subgroups continue to increase in Texas, it is important to evaluate effective spending practices in K-12 public education.

However, there appears to be a disconnection between that which TBEC and Murdoch are reporting and some other important state-wide initiatives. For example, the Governor’s industry cluster has ambitious plans to secure long-term prosperity in Texas.
Governor Perry’s official website defines the objective of the industry cluster Initiative as an initiative to stimulate long-term sustained growth and focus the allocation of state resources on key industry clusters that economists say will be the engine of job creation and economic development in the 21st century. The initiative outlined key steps for Texas to invest in human resources in order to develop the economic engine necessary for job creation and economic development. According to the report, “Economic development of the needed magnitude will require technological innovation and a highly skilled workforce. Therefore, human capital and the investment in human capital will be critical” (Governor Perry’s industry cluster report, 2006). The Governor’s initiative, however, makes no reference to Murdoch’s work. Obviously, education will be critical to the achievement of the initiative’s goal of investments in human capital, but there appears to be little discussion in this report regarding the changing demographics in Texas (Governor’s industry cluster, 2006).

Further disconnect appears evident in the recent publication of the House of Representatives Public Education Committee on resource allocation and budgeting. The subcommittee had several charges for the special session and prior to the 80th regular session. The charges for the House Committee were:

1. Study the impact of successful school choice programs on students, parents and teachers (Texas House of Representatives, 2006)

2. Review central administration and superintendent compensation, and investigate the extent to which administrator compensation corresponds to student performance (Texas House of Representatives, 2006)

3. Examine school district resource allocation, including ways that different types of high performing districts allocate funds among instruction, instructional support, operations and district administration (Texas House of Representatives, 2006)
4. Consider whether Chapter 21 of the Education Code is structured and administered in a manner that effectively promotes the state's educational goals (Texas House of Representatives, 2006)

5. Evaluate school district budgeting practices. Investigate ways to enhance the role of elected trustees in the design of district budgets and identify ways to make district budgets more accessible and transparent to the public (Texas House of Representatives, 2006)

6. Explore the structure and implementation strategies of successful performance-based pay systems for educational professionals in Texas and other states (Texas House of Representatives, 2006)

7. Identify ways to improve high school performance in terms of postsecondary readiness (Texas House of Representatives, 2006)

8. Research, review and investigate the expenditures of taxpayer money by local government and school boards to lobby the Legislature. Also research, review and investigate attempts by school district officials to skirt competitive bidding requirements with respect to facility renovation and construction contracts, and other relevant contracts, through the use of improper procurement contracts with associations or other school districts (Joint Interim Charge with House Committee on General Investigating and Ethics, 2006)

9. Study the adequacy of the state accountability system in measuring the effectiveness of Disciplinary Alternative Education Programs (DAEPs) based on academic performance, behavior modification and percentage of students referred to the juvenile justice system. (Joint Interim Charge with the House Committee on Corrections, 2006)

10. Monitor the agencies and programs under the committee's jurisdiction (Texas House of Representatives, 2006)

This study is important because it attempts to elaborate on the analysis of high-performing, high-poverty schools. The House Education Committee charge number three does not mention, nor do any of the other charges, the act of looking specifically at the resource allocation practices of high-performing, high-poverty schools. In light of Steve Murdoch's predictions, it seems that there would be some interest from state leadership to study successful high-poverty schools. This area of study will become increasingly more important in Texas in the coming decades, and the findings from this
study could help shape policy decisions for the future needs of the state.

Purpose of the Study

Because Texas is changing as a state, it will become increasingly more important to determine the school district’s role in helping schools become high performing. In a research report entitled, Effort and Excellence in Urban Classrooms: Expecting, and Getting, Success with All Students, Corbett, Wilson and Williams (1997) stated that:

A disproportionate number of poor children and children of color fall through the cracks in America’s schools; Poor students achieve less and drop out more than their wealthier counterparts. If school districts are determined to improve the performance of every single child and not just measure collective performance, they will have to make clear their understanding of what prevents students from achieving at full potential. (pp. 4, 68)

An additional advantage the current study has over previous resource allocation research is the opportunity to overcome some of the problems related to studying such large samples of schools. Several researchers have argued that it is difficult to study schools accurately nation-wide because of the complication of establishing common econometrics between different areas of the country. This study strived to overcome this problem to the fullest extent possible by constructing the sample from only Texas schools.

Whereas the current study was limited to Texas schools only, Texas was an ideal choice for a study of this nature because of its size and diversity, and using one state will assist in addressing issues related to common econometrics. Other problems related to econometrics, however, could arise due to the large size and diversity in Texas. The design of this study addressed those concerns by splitting the sample into campuses from mid-size and large schools from all of the geographical areas of the
state. It also addressed these issues by categorizing sample campuses by percentage of student membership in economically disadvantaged categories. This process allowed for the analysis of multiple groups to be considered differently, yet simultaneously.

Significance of the Study

This study contributes to the knowledge of educational success because it specifically analyzes relationships between spending patterns and student performances. In addition, this study used a growth model to evaluate student performance. This process ensures that student performance compares the same students to them over the four year period of analysis while at the same time considering variations due to socio-economic status of individual students. Student populations of low socioeconomic status are predicted to grow substantially as well in Texas. A research study that assesses the resource allocation practices of successful versus unsuccessful campuses will be useful for state officials. In addition, schools will benefit by gaining knowledge of resource allocation practices of high-performing campuses. If a relationship does exist between resource allocation practices and student achievement, then policy-makers need use these findings to assist in future planning regarding inputs and outputs.

Research Questions

The following research questions guided the study:

1. What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in reading for K-12 public school districts in Texas?
2. What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in math for K-12 public school districts in Texas?

3. What is the relationship between expenditures on instructional leadership/administration (Function 21) and student achievement in reading for K-12 public school districts in Texas?

4. What is the relationship between expenditures on instructional leadership/administration (Function 21) and student achievement in math for K-12 public school districts in Texas?

5. What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in reading for K-12 public school districts in Texas?

6. What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in math for K-12 public school districts in Texas?

The current political debate emphasizes the importance of reviewing the historical research body regarding whether or not money matters in public education. Beginning in earnest, with the Coleman report in 1966, numerous research studies have employed a variety of methodologies to attempt to gauge the effect of resource inputs on educational outputs. Odden (1994) articulated the complications in today’s educational environment when he discussed the current era of standards-based reform. He asserted that educating all students to high standards was increasing the demand for educational outcomes by a factor that was two to three times the current norm; however, this dramatic increase will need to occur without proportional increases in resources. To further complicate the discourse, reports and research studies from Hanushek asserted that the enormous funding increases for U.S. public schools this past century did not yield commensurate improvements in student performance (Hanushek, 1996).
The large body of research on the effects of school and classroom resources has generally been inconclusive. Most educators would argue, however, that resources must matter. A recent lawsuit in Texas indicated that at least a portion of the judiciary branch in Texas agrees that money does matter (*West Orange-Cove Consolidated Independent School District v. Shirley Neeley, Texas Commissioner of Education, et al.*, 2004). In 2004, over 300 districts in Texas contested the constitutionality of the state’s public school finance system. The lawsuit, *West Orange-Cove et al. v. Neeley et al.* argued that since most school districts were at or near the state imposed $1.50 tax cap and because the state participation of funding has been dramatically declining, that school districts had inadequate funds to satisfy the student performance standards mandated by the TEA. Simultaneous to the lawsuit and in attempt to address the question of whether school districts have sufficient funding, several cost function analyses were conducted and reported to education officials in Texas. One study was entered into evidence from the state and another entered into evidence by the plaintiffs. The state study concluded that the level of education funding in Texas was more than sufficient to meet state mandated performance goals. The plaintiff study concluded that Texas schools would need at least two billion dollars in additional revenue to satisfy the requirements of the state. The district court agreed with the plaintiffs, and a deadline was set for Texas lawmakers to correct the public education funding system, or public schools would be shut down (*West Orange-Cove v. Shirley Neeley*, 2004). In contrast, Imazeki and Reschovsky (2005) analyzed the two methodologies and reported their findings in a report published in the *Peabody Journal of Education* (2005). Their findings were contrary to the state’s findings. They asserted that a spending increase was
necessary in order for Texas to reach minimum student performance. In a subsequent special session, the Texas legislature developed a system that would meet the court order.

Some studies specifically address high-poverty schools and resource allocation practices. For example, Maclver and Balfanz’s (1999) meta-analysis of studies related to the school district’s role in helping high-poverty schools become high-performing schools outlined a number of conditions that were believed to promote high levels of academic achievement from students of low-socioeconomic background. In their meta-analysis, they asserted that the key to producing high-performing schools was to systematically and consistently work to create and sustain an environment in which all students have the motivation and opportunity to learn. Of 17 indicators outlined in their report, five have direct connection to additional financial resources. These five indicators helped shape the methodology of the current study. These five indicators are:

1. School provides tutorials for students needing extra help
2. Teachers participate in sustained, focused and curriculum-specific staff development that shows them how to successfully use new and more demanding curriculum materials, effective instructional strategies and content knowledge
3. The school is organized into small learning communities
4. Principals strongly, continually and visibly support this effort and reorganize the schools’ resources (i.e. time, people and resources)
5. A second tier of supportive, well-informed and coordinated leadership is developed at the school (i.e. vice principals, small learning community leaders and school improvement teams) (Maclver and Balfanz, 1999)

In addition to the review of current research, information regarding national trends of educational spending is important to the current study. According to the 2005-
According to ERS, in 2005-06, slightly more than two-thirds (68%) of local school district budgets, on average, were allocated to instructional services. In addition, 5.9% was allocated for school leadership, 5.8% for central office and school board services, 9.6% for student services and 10.4% for building operations. When specifically reviewing personnel costs, ERS reports that over three-fourths of school district budgets were allocated to staff salaries and benefits. Overall, classroom teachers received the largest portion of district budget allocations (65.6%). Auxiliary staff represented 26% of compensation and school-site leadership represented 5.1% of the total compensation. Central office accounted for 3.3% of staff compensation budgets. In addition, over the last decade, the responsibility for funding schools has shifted towards states and away from local sources. In 2005-06, states accounted for 49% of budgeted revenue, a rise from previous years. Local districts, however, are still responsible for providing a significant portion of revenue. In the same year, an average of 44.2% of funding was provided by local sources (ERS, 2006). As states begin to assume more responsibility for funding public schools, the need for research in allocation best practices is becoming more important.

The current study proposes to use these and other indicators as a basis for understanding where additional resources may have been successfully utilized Texas schools. Specifically, the study examined resource allocation comparisons between subsets of Texas schools and compared the inputs to outputs as measured by
continuous student achievement on state standardized assessments. In the future, a key to the educational success of Texas students will rely on a clear understanding of successful resource allocation practices.

Definition of Terms

The following definitions were used for the purpose of this study:

- **Academic Excellence Indicator System (AEIS)** - The public education accountability reporting system in Texas.

- **Accountability** - Comprehensive systems for establishing academic performance standards and assessment, and for assigning consequences to schools for non-performance.

- **Average poverty schools** - Campuses with 30-60% student population from low SES.

- **Commended Performance** - A category assigned to students for high academic achievement. Students in this category performed at a level that was considerably above the state passing standards. Students demonstrated a thorough understanding of the knowledge and skills measured at this grade level.

- **Economically Disadvantaged** - Students eligible for free and reduced lunch program under National School Lunch and Child Nutrition program. Also referred to as low SES (Socio-economic status).

- **ESL** - Students qualifying for Texas English as a Second Language program.

- **High-performing schools** - High-performing campuses were considered those campuses achieving recognized or exemplary status.

- **High-poverty schools** - High-poverty campuses are defined as campuses possessing greater than 70% of students from low socioeconomic standing.

- **Large-size schools** - School districts with 10,001-99,999 students.

- **Low-performing schools** - Low-performing was defined as campuses academically acceptable or academically unacceptable ratings.
• Low SES/Economically Disadvantaged - The student subgroup defined by those students who qualify for free and reduced lunch programs.

• Medium-size schools - School districts with 1,601-10,000 students.

• Student to teacher ratio - The number of students per teacher in a given classroom, given campus or given district.

• Small-size schools - School districts with less than 1,600 students. Campuses from these schools were excluded from the current study.

• Texas Assessment of Knowledge and Skills (TAKS) - The standardized, criterion referenced assessment for the state of Texas. Students annually take these assessments in grades 3-11.

• Texas Higher Education Coordinating Board (THECB) - The governing body for colleges and universities in Texas.

• Texas Education Agency (TEA) - The state-wide regulatory body for K-12 public schools in Texas.

Limitations

This study is limited to Texas schools and may not be generalized to other states; however, other states will be interested in these results from Texas due to its size and diversity. Additionally, the study is limited to budgetary data reported by the TEA through the state’s Public Education Information Management System© [PEIMS] (TEA, http://www.tea.state.tx.us/peims). Financial data regarding grants and special revenue were not included. The study is limited to four school years of student performance and financial data. High performance is measured solely on student performance on Texas Assessment of Knowledge and Skills (TAKS). There are no comparisons to national tests. The sample students do not represent 100% of students enrolled in each of the schools in the study. Student samples are limited to students in
elementary grades three through six who are constantly enrolled throughout the four years of review.

An important limiting factor in studies such as this one is the complexity of the measurements used to gauge school quality. The activities of teaching and learning are oftentimes difficult to measure. Thus, school quality is oftentimes measured in per pupil expenditures, teacher-pupil ratios and teacher salaries as well as instructional leadership, professional development and class size.
CHAPTER 2

LITERATURE REVIEW

Classic Debate – Does Money Matter?

This study expanded on an extensive body of research that investigates the perennial question: does money matter in public schools? Gerald Bracey perhaps best summarized the status of the debate in his Phi Delta Kappan article titled, *Money Matters: No It Doesn’t, Yes It Does*.; Bracey’s meta-analysis of research contended that results were inconclusive at best (Bracey, 1997).

The historical evolution of the classic debate is summarized in this chapter and extends that review into emerging studies related specifically to new research on resource allocation practices in schools. In addition, this study uses new methodologies for the study of resource allocation in schools. For example, Wood (1998) asserted that instead of solely studying whether or not there was a possible relationship, more emphasis should be concentrated on how resources were distributed, rather than how much money was available.

Odden (1994) outlined five new structural aspects in which he stated any new school finance system should possess. In his research, *Decentralized Management*, he asserted that the following structures of a sound school finance system would support an educational system that should produce higher levels of student achievement:

- A focus on the school as the key organizational unit
- A decentralization of power over the budget and personnel to schools
- Development of a comprehensive school level information system
- Investment of dollars in professional development and training
- Redesign of teacher compensation (Odden, 1994)

Four of the five structures outlined by Odden were utilized in the development of research questions and methodology in the current study. Teacher compensation was the only structure that will not be considered. The other four structures were tied directly to the current study.

*How School District Budgets Were Allocated in 2005-06*

According to the 2006 ERS, approximately 68% of every education dollar in our country was spent on instructional services. Table 3 shows the distribution of dollars in U.S. public schools and categorical definitions.

**Table 3**

*ERS Breakdown of Educational Spending in the United States*

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Services</td>
<td>All instructional costs, including guidance services, speech pathology and occupational therapy.</td>
<td>68.0%</td>
</tr>
<tr>
<td>School-site Leadership</td>
<td>All costs associated with the offices of the principals and their office staff.</td>
<td>5.9%</td>
</tr>
<tr>
<td>Student Services</td>
<td>All costs associated with health and attendance, student transportation, food service, student activities, materials, supplies, technology, travel, fuel costs and other student services.</td>
<td>9.6%</td>
</tr>
<tr>
<td>Central Office &amp; School Board</td>
<td>All costs associated with the board of education, executive administration and central services.</td>
<td>5.8%</td>
</tr>
<tr>
<td>Building Operations</td>
<td>All costs associated with maintenance, operations, heating and cooling and utilities (excludes capital outlay).</td>
<td>10.4%</td>
</tr>
<tr>
<td>Other</td>
<td>All costs not specified above</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

*Note. Information compiled from ERS Budget Report, 2006*

ERS reports some variance in expenditures based on enrollment size. Districts
with enrollment of less than 2,500 students allocated 5.7% of their budget to school-site leadership as compared to districts with enrollment of 25,000 or more students allocating 6.2% to this function. With regards to instructional services, rural districts allocated 65% of their budgets to this function and suburban districts allocated 68.7%. This differential may be due to higher transportation costs in rural districts since rural districts allocated 10.6% to student services (including transportation) as compared to suburban district’s 8.7% average. Thus, a smaller percentage of the rural school budgets may be available for the classroom due to increased operational costs in ratio to total student population (ERS Annual Report on Budgeted Revenue and Expenditures in Public School Systems, 2006). These differences are addressed in the methodology in that small school systems are eliminated from the sample.

ERS reports minimal change in total spending between the 2004-05 report and the 2005-06 report, however, they do note a slight increase in per pupil expenditures. In 2004-05, the per-pupil average expenditure is $8,056, and in 2005-06, the average is $8,479 in all reporting districts. This difference represents a total increase of 5.3%. Importantly, however, the instructional portion of the budget had only a negligible increase of 0.1% (from 67.9% to 68%). Another important notation by ERS is the amount of school budgets allocated for staff salary. Classroom teachers represent 65.6% of school budgets. Auxiliary staff represents 26% of school budgets. Administrators make up 8.4% with 3.3% at central office and 5.1% in campus leadership (ERS Annual Report on Budgeted Revenue and Expenditures in Public School Systems, 2006). Whereas these data are important to the broader context, this study took the analysis from a broader context down to expenditures at the campus level in a
way that compares successful campus’ expenditures to unsuccessful campus’ expenditures.

Another important component of the ERS report, which provides background information for the current study, is the breakdown of the types of budget sources from which schools receive their funding. Table 4 illustrates school revenue sources between school years 1995-96 and 2005-06. The table notes a decrease in local funding and an increase in state and federal funding. As states assume a greater fiscal role in school funding, research will be necessary to guide decision-making.

Table 4

Average Percentage of Revenue from Local, State, and Federal Sources for Years 1995-96, 2000-01 and 2005-06

<table>
<thead>
<tr>
<th>Source</th>
<th>1995-96</th>
<th>2000-01</th>
<th>2005-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>50.5%</td>
<td>43.4%</td>
<td>44.2%</td>
</tr>
<tr>
<td>State</td>
<td>46.0%</td>
<td>51.9%</td>
<td>49.0%</td>
</tr>
<tr>
<td>Federal</td>
<td>3.4%</td>
<td>4.6%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

Note. ERS, Budgeted Revenues and Expenditures in Public School Systems-2006 Update

Resource Allocation Terminology

The language and terminology used in previous school resource allocation research must be clearly understood before beginning new research. In an attempt to establish the research language for this study, terminology was partially utilized from the work of the Southwest Educational Development Laboratory (SEDL, 2001). The lab described a model for examining resource allocation and student achievement named the Educational Production Function Model as the standard format for school resource allocation discussion. They defined educational production function as a mathematical
description of how inputs (independent variables) contributed to outcomes (dependent variables). Most commonly, these were expressed in the form of a linear equation that related outputs (usually test scores) to inputs (expenditures). This study utilized, to a large extent, this definition and process with slight modifications (SEDL, 2001).

**Coleman Report-1966**

The Coleman Report of 1966 was one of the early research studies using the production function model. Coleman found little association between inputs and outputs. His study sampled nationally represented students and schools. Coleman and his associates determined that family background characteristics had the largest and most statistically significant effect on student performance. Since the Coleman report, nearly 400 additional similar studies have been conducted expanding on this knowledge base (Coleman, 1966).

**Hanushek – Input-based Economics**

Hanushek (1996) contended in numerous studies that enormous funding increases for U.S. public schools have not yielded commensurate improvements in student performance. In addition, Hanushek emphasized that an over-concentration on input analysis, rather than production, lead to severe misunderstandings regarding the true importance of resource allocation. He conducted several meta-analyses from 1989 to 2000 regarding production function. In 1989, one such meta-analysis explored both expenditure and resource allocation measures. His conclusion was that no relationship existed between the inputs measured and academic achievement. In his research, he
placed inputs in one of several categories (per-pupil expenditures, teacher experience, teacher salary, teacher-student ratio, administrative inputs and facilities). He then examined the relationship between inputs and outputs and classified the results as either, positive and statistically significant, positive and statistically nonsignificant, negative and statistically significant, negative and statistically nonsignificant and statistically nonsignificant but of unknown direction. Hanushek found most relationships to be nonsignificant in the meta-analysis and concluded that there was no strong or systematic relationship between school expenditures and student performance (Hanushek, 1989).

To exacerbate the classic debate, Greenwald, Hedges and Laine (1994) reanalyzed the same studies used in Hanushek’s original study, yet drew several different conclusions. In their counter study, Greenwald et al. excluded from their analysis the relationships that Hanushek had classified as nonsignificant but of unknown direction. They contended that there should be no unknown direction (Hanushek, 1989) in such a research study. In their counter argument, they contended that researchers should make a definitive determination of direction in all components of the study. They also argued that if relationships of unknown direction would have been excluded, more than 5% of these relationships would have been scored in the positive direction and that the bulk of what Hanushek termed insignificant relationships would have actually been concluded to be in the positive direction (Greenwald, Hedges & Laine, 1994).

Greenwald et al. (1994) also applied a different significance test, the inverse chi-square, to combine the relationships. By doing this, they tested two hypotheses
simultaneously and found that for the full sample of relationships almost all were significant in the positive direction. Therefore, they found positive coefficients for per-pupil expenditures, teacher experience, teacher salary, administrative inputs and facilities. The results for class size were generally mixed. Their final conclusions were to a large extent the opposite of Hanushek’s while using the same data sample. Their study established a precedent that even the slightest difference in research methodology could change the outcome of research studies related to school resource allocation.

Hanushek (1996) continued the discourse with an updated meta-analysis adding to the original sample for a grand total of 377 studies included. Following the methodology similar to his past studies, he classified findings into seven categories and again found no relationship between resource allocation and achievement. In a second counter study, Greenwald, Hedges, and Laine (1996) created a new sample of studies and utilized a slightly different study of categories including per pupil expenditures, teacher ability, teacher education, teacher experience, teacher salary, teacher-pupil ratio and school size. With the new meta-analysis, they found that the combined significance test and medium effect sizes supported the hypothesis that resources do have a positive impact on achievement.

The fact that studies of such elaborate methodologies, using basically the same data, yet still having different results, demonstrated the volatility of the research base. In an effort to explain, Wenglinsky (1997) purported that this lack of consensus among the meta-analyses reflected, to some degree, the shortcomings of the original studies used in the meta-analysis. He noted several shortcomings in the aforementioned meta-
analyses: Four of Wenglinsky’s observations shaped the current study. Those four observations are:

- Most studies did not take into account the ways in which other factors may have influenced the process of education and the impact that these unique influences may have mediated between spending and achievement.
- Most studies did not consider any measures of student background. If socioeconomic status is ignored, it is difficult to determine if relationships existed between spending and achievement.
- Most studies did not control for variations in costs between regions of the United States (U.S.).
- Most of the studies used unsophisticated measures of student achievement (Wenglinsky, 1997).

This study attempted to use Wenglinsky’s observations and overcome these shortcomings by taking into account student backgrounds and comparing a sample that used the same financial formulas during the time period which was studied. However, the methodology was developed in a way that allowed for analysis of different expenditure functions. The student achievement data was converted to a growth model to address concerns of the data being unsophisticated.

**New Analysis Methodologies**

Monk (1992) doubted that problems associated with production function approach could be addressed. Instead, he proposed to shift the unit of analysis for school resource studies to the classroom level. He called for a research program in which teachers were interviewed to provide retrospective information on the problems they faced and the degree to which resources assisted or acted as a constraint. Monk asserted that the only way to truly understand the impact of resource allocation was to
study the classroom unit. He contended however, that the ability of researchers to objectively study resource allocation under such a model would be difficult.

Another alternative to production function research was proposed by Fortune and O'Neil (1994). They claimed that problems in production function studies existed because of the use of linear models of study and that input-output relationships actually occurred in a punctuated manner which they describe as being non-linear. They described the punctuated model as a system in which small increments of inputs can have no effect on achievement but large increments can have a large effect. They proposed using a model of comparison that evaluated the mean achievement of demographically similar schools that were in the top 30% of spending to schools that were in the bottom 30%. In addition, they argued that any chosen output variable may be major in one district and the same variable in another district may be considered minor. They concluded that a variable specification problem occurred when the measurement in a particular study did not represent the entire student body.

Fortune and O'Neil (1994) concluded that longitudinal data in different studies produced somewhat different findings depending on its disaggregation. Therefore, it was important that future studies track both longitudinal inputs and outputs for a specific sample of campus-wide student groups and/or schools. This finding dramatically impacted the development of the current methodology in that a more sophisticated student achievement model (Mplus) was utilized to ensure that outputs were truly longitudinal in nature.
Other Resource Allocation Studies

In addition to the landmark studies in the production function debate, other independent research efforts have added to the body of knowledge. Nyhan (1999) used a statistical analysis to test the relationship of class size and per pupil expenditures. His study was conducted in three south Florida counties. He found that there was modest support for the targeted expenditures for classes above 20 students. In addition to these findings, his research supported previous findings that poverty is a primary determinant of student achievement.

Miles and Darling-Hammond (1997) argued that too little research addressed how schools might organize teaching resources more effectively at the school level. Their research attempted to describe case studies of five high-performing public schools that organized resources in innovative ways. Although the schools were very different in student makeup, they shared five principles in resource allocation practices: (1) reduction of specialized programs and more effort to reduce student-to-teacher ratio; (2) more flexible student grouping; (3) structures to support relationships; (4) longer blocks of instructional time; and (5) more time for teachers to plan lessons together. They reported that high performing urban high schools departed from traditional approaches in the above ways. The study primarily addressed the reallocation of existing funds and not measuring changes in the total amount of dollars invested. In addition to the five principles, they also provided a list of typical barriers to the reallocation of resources.

Those barriers were:

- Reluctance to make difficult decisions, i.e. innovation
- Selection and retention of knowledgeable, committed teachers
• Policies, regulations and contractual issues
• Student grouping policies (Miles & Darling-Hammond, 1997)

**Southwest Regional Studies in Resource Allocation**

In addition to the previously discussed research studies, two research studies conducted by (SEDL, 2001) were considered during the development of the current study. These two research studies examined resource allocation practices in the southwest region of the U.S. A SEDL study conducted by Pan (2004) explored resource allocation practices in 12 school districts in Arkansas, Louisiana, New Mexico and Texas. The 12 districts in the study were labeled as *improvement schools* based on student achievement measurements over a five year period. The schools represented varying levels of student membership from rural, urban and suburban status. The percentage of minority and/or poverty students were higher than the applicable state average in each case. Multiple analyses of qualitative and quantitative data were performed as well as descriptive statistics and cross tabulations. The study concluded that when compared to other districts with similar demographics in their state, the 12 school districts were found to have spent more per pupil over a five year period in direct instruction. In addition, it was determined that the districts engaged in needs-based budgeting, flexible fund management, innovative staffing patterns and leveraging of outside resources. In addition to these findings, Pan found that all 12 districts explicitly engaged in a dramatic focus on standards and benchmarks which led to data-driven decision making. These schools increased the use of technology, emphasized instructional programs for math and literacy, and they invested heavily in at-risk
programs, with priority towards professional development. These campuses gave substantial attention to community and parent initiatives. They also invested heavily in the development of school and district leadership (Pan, 2004). The study concluded that spending at the 12 schools was generally prioritized toward student instruction more than in comparison districts. An extension of this research was an important component to this study. The current study also sought to determine if more dollars towards student instruction had a positive impact on student growth over time.

In a second study, SEDL (2001) attempted to answer a similar set of research questions addressing resource allocation practices of improving school districts. SEDL reported that between 1987 and 1998, the proportion of the state contributions to education funds in Arkansas, Louisiana, New Mexico, Oklahoma and Texas had generally declined from 49.5% to 48.4%; however, states continued to play a dominant role in school funding and decision making. SEDL (2001) concluded that with declining state resources and higher state involvement in decision-making, state leaders should carefully and thoughtfully consider a range of issues such as revenue adequacy, teacher assignments, school-based decision making and incentives for improved performance. In light of these important issues, SEDL found that schools with varying levels of student performance allocated resources differently and that strategies, attitudes and experiences of these schools, with regard to resource allocation, were found to be unique. SEDL recommended that an in-depth study of districts would reveal useful information about resource allocation practices for schools that have exhibited consistent sustained performance over time (SEDL, 2001). The current research is an
extension of that recommendation attempting to narrow the discourse of high performing schools to high-performing and high-poverty schools.

**High-performing, High-poverty Schools**

According to the Center for Public Education, schools with high-poverty rates have struggled to educate students successfully. For approximately two decades, educational researchers have explored how schools with high numbers of poor students could be as successful academically as schools with high numbers of more advantaged students. This research included studies related to resource allocation as well as other factors (Center for Public Education, 2005). This study was interested more in resource allocation practices; however, a fundamental understanding of other successful practices is important. Following is a summary of this research on high-performing, high-poverty schools.

**Common Belief - All Students Can Learn**

Kannapel and Clements (2005) and Carter (2000) contended that successful high-performing, high-poverty schools supported the belief that all students can and will learn. High poverty schools with higher student faculties that believe in their students, set high goals for their students and have professional development activities that promote supportive and nurturing classroom environments. Their research explored the impact of creating a school culture of high expectations imbedded in a caring and nurturing environment. They found that schools with concrete and achievable goals
which were communicated in a manner that students can readily understand, increased student achievement (Kannapel & Clements, 2005).

**Ongoing Assessment**

Successful high-poverty schools continually assess students, determine areas of need and plan or changed instruction to meet student needs. Other researchers found that the practice of ongoing assessments promoted higher levels of student achievement in high-poverty schools (Carter, 2000; Corallo & McDonald 2001; Kannapel & Clements, 2005). These practices generally allowed teachers to individualize instruction for more students. These studies concluded that the primary purpose of testing at high-performing schools was to diagnose and guide the instruction for individual students. At successful schools, teachers used assessment data to identify areas of the curriculum where students needed to improve and adjusted teaching strategies accordingly. Barth, Haycock, Jackson, Mora, Ruiz, Robinson and Wilkins (1999) studied 366 high-performing schools. They reported that 81% of the 366 schools established comprehensive systems for monitoring student progress regularly and frequently. Strategies included weekly assessments that used pre-test and post-test as well as periodic benchmarks (three or six week intervals). These research studies concluded that diagnostic assessment created an internal sense of urgency towards continual improvement and enhanced student performance in high-poverty schools.

**Curriculum Alignment**

Barth et al. (1999); Corallo & McDonald (2001); and Kannapel & Clements (2005)
found that by vertically and horizontally aligning curriculum with instructional practices and assessment provided teachers with the most appropriate system for student success. Instruction following established standards ensured that students were taught the material they needed to learn in order to be successful at any particular future grade level.

**School Leadership**

Kannapeli and Clements (2005) reiterated the importance of school leadership in high-poverty schools. They outlined that although leadership styles may vary, successful administrators in high poverty schools included their staff in making key decisions regarding school matters as well as curriculum and instruction decisions. The Council of Chief School Officers (CCSSO) and the Charles A. Dana Center (2002) added to this understanding of school leadership by elaborating that successful high-poverty schools allowed teachers to collaborate across grade levels and curriculum areas to ensure that teachers and students received the support they need. Classroom teachers and specialists (e.g. reading specialists, math specialists, counselors) worked together to share responsibility for student learning.

Also important to the current study was a better understanding of the use of data in the decision-making process when school administrators are allocating resources. According to Byrd (2009), accountability measures require school leaders to have skills not only in collecting and analyzing data but also in using data to establish priorities, to determine skills that need to be addressed, and to ensure sustainability of academic
gains. According to Byrd (2009), aspiring school leaders graduate from many leadership programs being unprepared “to engage in using data or systematic in Inquiry” (p. 4).

Successful School Analysis

In addition to the aforementioned research, an Education Trust study profiled 366 elementary and secondary schools from 21 states (in rural and urban settings). The schools in the study included schools from a variety of racial and ethnic groups as well as students who speak little or no English. More than one-half of the students were from low income families in the profile schools. The study recommended six practices that were found to be common among successful schools:

- Use state standards extensively to design curriculum and instruction, assess student work and evaluate teachers based on those standards
- Increase instructional time in reading and math in order to help students meet standards
- Spend a larger portion of funds to support professional development focused on changing instructional practice
- Implement comprehensive systems to monitor individual student progress and provide extra support to students as soon as it is needed
- Focus efforts to involve parents in helping students meet standards
- Develop state or district accountability systems that have real consequences for nonperformance (Barth et al., 1999)

To some degree, these findings shaped the methodology of the current study as spending practices are being analyzed by studying the campus resource allocation in functions that most strongly correlated with instruction.

Maclver and Balfanz (1999) conducted an extensive meta-analysis of the school and classroom level conditions that promoted high-levels of learning. They organized
their study around three themes that addressed the following three research themes:

1. At the student level, motivation and opportunity to learn are increased when...

2. Each teacher’s ability to create an environment that helps motivate students and gives them strong opportunities to learn is enhanced when...

3. Each school’s ability to create an environment in which all student and teachers can teach and learn at high levels is advanced when… (see outcomes below)

Their findings, based on these three themes, were as follows:

Theme 1: At the student level, motivation and opportunity to learn are increased when...

- Common core, standards-based curriculum that is coherent, consistent and increasingly complex and challenging across grade levels is effectively implemented school-wide

- Instructional strategies that maximize teaching for meaning, motivation to learn and peer support for learning are used

- Strong and supported student-teacher bonds are created

- Extra help for all students who need it is effectively delivered

- Students understand what they need to do to realize their educational, occupational and life aspirations

- Strategic school-family-community partnerships support student learning at school, at home and in the community (Maclver & Balfanz, 1999)

Theme 2: Each teacher’s ability to create an environment that helps motivate students and gives them strong opportunities to learn is enhanced when…

- Teachers participate in sustained, focused and curriculum-specific staff development that shows them how to successfully use new and more demanding curriculum materials, effective instructional strategies and content knowledge

- Teachers receive in-class implementation support from a respected peer in a non-evaluator setting

- The school is organized into small learning communities (Maclver & Balfanz, 1999)
Theme 3: Each school’s ability to create an environment in which all student and teachers can teach and learn at high levels is advanced when...

- There is a school-wide commitment to help students become proficient and meet standards
- Principals strongly, continually and visibly support this effort and reorganize the schools’ resources (i.e. time, people and resources)
- Principals provide instructional leadership and support to ensure that strong learning opportunities and motivation exist in every classroom in the school
- A second tier of supportive, well-informed and coordinated leadership is; developed at the school (i.e. vice principals, small learning community leaders, and school improvement teams)
- All key stakeholders are kept informed of progress and problems and have a forum for giving input and for influencing the school’s reform efforts
- The school staff gathers and uses data in an intelligent and informed manner to make decisions (Maclver & Balfanz, 1999)

In summary, based on this meta-analysis, Maclver and Belfanz (1999) stated that the local school districts were the appropriate agent for reform efforts and districts needed to apply reform measures in their local environment. No two districts accomplished this in exactly the same way, but, in each case, a sustained effort was made to provide schools with the support they needed in order to create conditions that result in strong learning environments (Maclver & Balfanz, 1999). This meta-analysis was important to the current study in that it helped guide the methodology and selection of dependent variables.

In another related study, titled *Inside the Black Box of High-Performing High-Poverty Schools*, Kannapel and Clements (2005) found similar characteristics in high-performing Kentucky schools. The research question centered around a better
understanding of the common characteristics that seemed to contribute to high student performance shared by high-performing, high-poverty schools in Kentucky. The study included 26 elementary schools and seven middle schools. The schools were selected based on 50% or more of students on free and reduced lunch, state academic index of 75 or higher for minority students, progress on state assessments over time and a range of types and locations of schools (such as urban, suburban and rural). The common characteristics included the school-wide ethic of high expectations for faculty, staff and students; principals held high expectations for faculty and staff, which in turn held high expectations for themselves and students; and there was a strong belief that all students could succeed academically and that faculty and staff were capable of making this happen. In addition, the campuses demonstrated caring, respectful relationships in each of the schools, while maintaining strong academic and instructional focus. Each of the successful schools maintained systems for assessing individual students on a regular basis. This process was important because it allowed for change in instruction to meet specific student needs. Campus staff participated in collaborative decision-making processes led by non authoritarian principals. Strong work ethic and high faculty morale are common among these successful schools (Kannapel & Clements, 2005).

State of Texas Growing in Low-SES Students

The current study evaluated effective resource allocation in high-poverty high-performing schools. This area of study was particularly important to Texas in light of state demographer Steve Murdoch’s 2002 report. Murdoch’s comprehensive...
assessment of Texas’ current status and future growth encouraged research inquiries of the type proposed herein. As Texas population continues to grow in total number and percentage of diversity, efforts directed toward increased understating of resource allocation input and the impact on student success outputs are vital. Murdoch reviewed data from the 1990-2000 decade and used a forecast analysis to create growth projections for Texas, which he acknowledged has limitations, especially in that the further the study gets away from the 2000-2010 decade, the less accurate the projections. However, in the aggregate, Murdock reported that growth in Texas, from 1990 to 2000, was a result of 49.7% due to natural increase (births-deaths) and 50.3% due to net immigration (from other states and other countries). These two factors contributed to a total growth of 22.8% from 1990-2000. This increase was the largest increase of any decade in the history of Texas and he predicted that this trend will continue (Murdoch, 2002).

Change in Racial / Ethnic Composition

In addition to total growth, Murdoch also reported dramatic changes in diversification of racial/ethnic composition of the population in Texas in the 1980s and 1990s. Table 5 demonstrates that the greatest changes in population were coming from non-Anglo groups, especially Hispanic.
Table 5

*Percentage Changes in Ethnic Composition from 1980 to 2000*

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglo</td>
<td>10.1%</td>
<td>7.6%</td>
</tr>
<tr>
<td>African American</td>
<td>16.8%</td>
<td>22.5%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>45.4%</td>
<td>53.7%</td>
</tr>
<tr>
<td>Other</td>
<td>88.8%</td>
<td>81.2%</td>
</tr>
</tbody>
</table>


As a result of these changes, the total proportion of Texas comprised of Anglo populations has declined over time and non-Anglo has increased accordingly. Table 6 summarizes the growth and decline of subpopulations in ratio to the total population.

Table 6

*Changes in Total Ethnicity in Texas from 1980 to 2000*

<table>
<thead>
<tr>
<th>Group</th>
<th>1980</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglo</td>
<td>65.7%</td>
<td>60.6%</td>
<td>53.1%</td>
</tr>
<tr>
<td>African American</td>
<td>11.9%</td>
<td>11.6%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>21.0%</td>
<td>25.6%</td>
<td>32.0%</td>
</tr>
<tr>
<td>Other</td>
<td>1.4%</td>
<td>2.2%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>


Substantial population increases are projected for Texas for the coming decades, Murdoch predicts that by 2010, the total population could be between 24.2 million and 25.9 million, and by the year 2040; the total population could be between 35 million and 50.6 million. As depicted in earlier charts, this growth will come primarily from non-Anglo subgroups and ethnicities. Texas will have an increasingly diverse population and will
have an aging and age-stratified population. At least 60% of all households will be non-Anglo and in the absence of change in socioeconomic growth, income growth will not keep pace with household growth and average household incomes will decline. Total tax revenues will increase; yet, per household tax levels will decrease, and per-household consumer expenditures will be reduced, as well as net worth and assets. The Texas workforce will grow, diversify and age and will be less well-educated and less skilled. At the same time that the demand for workforce training will increase, the labor force will generally earn less (Murdoch, 2002). In light of these changes in Texas, Murdoch (2002) predicted the following for public education in Texas:

- Texas may add nearly 3.8 million more students in the next 40 years;
- School populations will become increasingly non-Anglo
- Costs for all forms of education will increase
- The need for specialized education programs will increase
- The need for financial assistance for students in colleges and universities will increase

*Murdoch Summary*

Murdoch (2002) summarized his extensive report by noting that the baseline patterns of population change in Texas suggested that in the absence of socioeconomic resources, Texas will experience reduced levels of education, reduced incomes, and increased levels of poverty and will increase in the need for a variety of state social services. These demographic changes will likely produce major socioeconomic changes in Texas. In general terms, due to the baseline conditions of population change, Texas will have a population that will be poorer and less educated. Texas will have a
population that is likely to be less competitive in the increasingly international labor market.

According to Murdoch’s report, education appears to not only be critical as it relates to increased income and consumer expenditures but also through reduced public costs. Education is only one answer to changing the socioeconomic differentials among racial/ethnic groups in Texas, but it may have the greatest potential to address the challenges likely to result from the projected future population patterns in the state (Murdoch, 2002).

Picus (2004) called a similar approach to studying resource allocation the successful school district approach. Picus asserted the key to using an approach such as this is being able to determine the difference in how successful and unsuccessful schools allocated resources. He believes that one of the primary benefits to such an approach is the ability to easily explain results to the general public. Because of the complications associated with explaining metrics that are generally utilized in attempting to establish production-function models, he asserts that a successful school model is a better approach. This study utilized a blended approach in its methodology, but drew heavily from Picus’ successful school district approach.

Summary

Miles and Darling-Hammond (1997) argued that a clear understanding of the principles of resource allocation could help schools and districts to better utilize improvement initiatives. Loeb (2003) continued this line of research by stating that it is critical to expand our knowledge of ways in which high-performing, high-poverty schools
use resources effectively. Researchers have developed econometric models for studying school resource efficiency; most commonly discussed in this review of literature is the production function model. Over time, however, results from production function studies have yielded contradictory results. Researchers have reached vastly different conclusions regarding the importance of resource allocation in American public schools. What is not well known in this research is whether there are effective resource allocation practices in schools comprised primarily of high-poverty students. Whereas educational administrators and school board trustees intuitively assert that resources must matter, they lack a clear research base to draw from when relating to schools of poverty. As the state of Texas continues to grow in total size and ethnic diversity, it will become increasingly more important to study the resource allocation practices of successful high-poverty Texas schools.

The research in this study adds to the knowledge base related to best practices of high-poverty schools in Texas. By studying the resource allocation practices of high-poverty schools, in a way that specifically compares high-performing to low-performing schools, important knowledge will be gained. This study addressed how much money was put into a campus system, and also how the money was then distributed within the system.

There is substantial debate in this country whether or not additional funding (inputs) equates to increased student performance (outputs). By drawing on traditional models of study and the Picus model, this study narrowed the research question to high poverty, high performing schools compared to high poverty, under-performing schools.
In addition to Picus, the review of literature in Chapter 2 overviewed previous works of research that primarily dealt with:

- Historical roots of production function studies
- General expenditure patterns in education in the U.S.
- Analysis of common characteristics of improving schools
- Complications with econometrics in production function studies
- Common characteristics of high-performing, high-poverty schools
- Dramatic changes in Texas student demographics

The information gleaned from previous research shaped both the direction of and the processes used for statistical analysis of this study. Four of the studies, however, had the most direct impact on the current study. Table 7 outlines the importance of each of these four and how the current study advances the research from the previous work.
Table 7

Four Studies Impacting Current Study

<table>
<thead>
<tr>
<th>Study</th>
<th>Focus</th>
<th>Sample</th>
<th>Methodology</th>
<th>Findings</th>
<th>How Current Study Advances This Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barth</td>
<td>Study of common practices among high performing, high poverty schools.</td>
<td>366 elementary and secondary schools with greater than 50% of students at poverty level or higher.</td>
<td>Survey to over 1,200 schools</td>
<td>Top performing, high poverty schools do the following: -Use state standards to design curriculum -increase instructional time in reading and math -Devote more funds to staff development -monitor individual student progress -focus on parental involvement -Consequences for non-performance</td>
<td>The conclusions drawn in the Barth were based on responses to surveys. The current study will look at similar traits of high-performing, high-poverty schools in a more quantitative approach by utilizing the study of resource allocation functions to verify the actual dollars spent.</td>
</tr>
</tbody>
</table>

*(table continues)*
Table 7 (continued).

<table>
<thead>
<tr>
<th>Study</th>
<th>Focus</th>
<th>Sample</th>
<th>Methodology</th>
<th>Findings</th>
<th>How Current Study Advances This Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pan 2004</td>
<td>Examination of resource allocation practices in 12 schools</td>
<td>12 public schools in Southwest that demonstrated consistent improvement over a five year span</td>
<td>Analysis of NCES-CCD databases, interviews and surveys</td>
<td>Twelve improvement schools were found to have spent more per pupil on direct instruction</td>
<td>Five years of success was used to determine if the school was an improving school, however, the study did not evaluate the resource allocation practices for all five of those years. The current study advances the knowledge in a way that compares expenditures and performance for each year of the study.</td>
</tr>
<tr>
<td>SEDL 2001</td>
<td>What are expenditure patterns over time in school districts considered improving schools?</td>
<td>Arkansas Louisiana Oklahoma Texas State performance data</td>
<td>Review of existing data bases, surveys and interviews. Financial data collected by expenditure function</td>
<td>Whereas this study did limit production-function econometric concerns by limiting study to southwest and by using NCES-CCD, the study did not narrow the study to relationships between resource allocation and successful schools.</td>
<td>The current study advances the knowledge gained in this study by specifically studying resource allocation practices of more successful schools compared to less successful schools.</td>
</tr>
</tbody>
</table>
Table 7 (continued).

<table>
<thead>
<tr>
<th>Study</th>
<th>Focus</th>
<th>Sample</th>
<th>Methodology</th>
<th>Findings</th>
<th>How Current Study Advances This Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wenglinsky 1997</td>
<td>School district expenditures and school resources can influence student achievement and availability of resources has real consequences for school climate</td>
<td>National-NAEP results, CCD and teacher cost index (TCI)</td>
<td>Analyses were conducted on district-level database using a structure equation modeling program-LISREL 8</td>
<td>The study was able to produce results that were national in scope and overcame production-function concerns (to a limited degree)</td>
<td>The current study considered the concerns outlined by Wenglinsky regarding the production function model when developing methodology. Whereas the current study was not national in scope, the state of Texas was purposefully chosen because of its size and diversity. The current study will advance the work of Wenglinsky by utilizing a derivation of his production-function model.</td>
</tr>
</tbody>
</table>
CHAPTER 3

METHODOLOGY

This study explored the relationship between financial resource allocation and student achievement over time. Specifically, it targeted campuses with high percentages of students qualifying for free and reduced lunch programs. Although a substantial amount of the existing body of research is devoted to financial resource impact on student achievement, relatively little research specifically targets the study of schools possessing a majority of high-poverty students. The review of literature indicated that some previous studies found no relationship between expenditures and student performance; whereas other studies concluded there was a correlation. The current study extended previous works in a way that specifically targeted high-poverty, high-performing schools compared with high-poverty, low-performing schools in Texas. The study used the growth mixture model to analyze longitudinal effects. This statistical analysis approach is outlined in greater detail later in chapter 3. Texas was chosen for the analysis due to the quality and availability of student, campus and district-level data. As student demographics in Texas have shifted and will continue to shift towards more representation of students from low income families, this study provided insight for policy-makers and school personnel in resource allocation practices.

Research Design

The research design was largely impacted by analysis of previous research designs regarding school resource allocation. Since Coleman (1966), most research designs of this nature have centered on input-output models that could best be
summarized by the following formula: \( A = f(E, B, I) \) Where \( f \) is the function of and \( A=\) student achievement, \( E=\) education inputs, \( B=\) background characteristics, \( I=\) innate ability (Harter, 1998; Deller & Rudnicki, 1993; Dolan & Schmidt, 1987). In this model, student achievement was seen as a function of inputs including resources, such as per-pupil expenditure, as well as background characteristics such as ethnicity, wealth and the student's innate ability. Over time, researchers have developed numerous derivations of this base model. The current study investigated the extent to which variations in spending in specific areas had relationship with variations in student performance. In addition, variations of these inputs were studied with students from high-poverty schools and average-poverty schools.

**Research Questions**

The following research questions guided the study:

1. What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in reading for K-12 public school districts in Texas?

2. What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in math for K-12 public school districts in Texas?

3. What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in reading for K-12 public school districts in Texas?

4. What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in math for K-12 public school districts in Texas?

5. What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in reading for K-12 public school districts in Texas?
6. What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in math for K-12 public school districts in Texas?

Hypothesis Statements

The following null hypotheses were established to guide the study:

1. No relationship exists between amount of expenditures in instruction (functions 11 and 95) and student achievement in reading for K-12 public school districts in Texas.

2. No relationship exists between amount of expenditures in instruction (functions 11 and 95) and student achievement in Math for K-12 public school districts in Texas.

3. No relationship exists between amount of expenditures in instructional leadership/administration (Function21) and student achievement in reading for K-12 public school districts in Texas.

4. No relationship exists between amount of expenditures in instructional leadership/administration (Function21) and achievement in Math for K-12 public school districts in Texas.

5. No relationship exists between amount of expenditures on support services (functions 31, 32, 33) and student achievement in reading for K-12 public school districts in Texas.

6. No relationship exists between amount of expenditures on support services (functions 31, 32, 33) and student achievement in Math for K-12 public school districts in Texas.

Participants

The Texas public school system provides a large, ethnically diverse student population for research purposes. The sampling was designed to take advantage of the size and diversity of the state. The data inquiry required three primary steps. First, campus selection was determined to ensure broad representation from throughout the state. Second, campus-level financial data was requested and finally, student-level
performance data was requested. This information was provided by the Texas Education Agency (TEA, PEIMS Report, 2007).

Step 1 – Campus Selection

The initial request was large to increase the size and scope of the sampling so that a broad representation of the state was included. Campus selection was then narrowed down based on specific criteria; however, campuses were purposefully selected from all over the state.

The initial inquiry to TEA yielded over 8,000 campuses. The following parameters narrowed down the sample:

- K-6 campuses only were selected. These campuses had TAKS test takers at the 3rd, 4th, 5th and 6th grade levels for each of the years, 2002-03, 2003-04, 2004-05 and 2005-06. Other configurations such as K-4, 5-6 were excluded. This step ensured that student performance was more uniform in that only like campuses were selected and that student performance data was only utilized for students present at the target campus for all years of analysis

- Campuses from each of the 20 Education Service Centers (ESC) regions of the state were sought. Ultimately, this was not possible; however, campuses were selected from North Texas, Dallas-Ft. Worth Metroplex, Austin, San Antonio, the Rio Grande Valley and Gulf Coast regions. These regions are listed later in chapter three

- Campuses were excluded that came from districts of 1,600 students or less in K-12. This effort was taken to eliminate concerns that the small school cost of the education index (CEI) might negatively alter results. According to Texas Education Agency (TEA), Financial Accountability System Resource Guide (FASRG),"many small rural districts suffer a hardship due to diseconomies of scale. Small schools will have a considerable higher per pupil cost than a larger school district. To lessen the hardship, the Foundation School Program (FSP) allotment formula allows for a small school district adjustment. In addition, transportation costs in small, rural schools are generally higher in the state of Texas. This modification to the funding formula is called a population sparcity adjustment. The adjustment is rationale for increase in FSP payments to small schools. The state considers small school districts those schools with 1,600 students or less" (FASRG, 2006)
• Campuses were excluded from districts with over 100,000 students, which is primarily Houston and Dallas. This exclusion helped make the campus sample more generalizable due to the unique nature of these two extremely large school districts.

This process reduced the number of sample campuses to 400 while maintaining representation from most major regions of the state. The step, outlined below, narrowed the 400 campuses down to 81 campuses. These 81 campuses became the final sample.

The final step in building the campus data set was to establish criteria to utilize to ensure that campuses could be categorized as high-performing and under-performing as well as high-poverty and average poverty. High-performing campuses were considered those campuses who achieved an academic rating of either recognized or exemplary status based on Texas Academic Excellence Indicator System (AEIS). Texas schools annually receive one of four ratings, exemplary (highest performing), recognized, academically acceptable and academically unacceptable (lowest performing). The under-performing campus sample was comprised of campuses who achieved academically acceptable or academically unacceptable on AEIS. Once these delineations in the campus groupings were made, an additional split was made to divide campus groups into sub-groups which represented districts with 1,601–10,000 students and another group from campuses in districts with 10,001-99,999 students. For purposes of separating campuses into high poverty and average poverty, campuses with 70% or higher students qualifying for free and reduced lunch (low SES) were classified as high poverty campuses, and campuses with 30-60% students qualifying for free and reduced lunch (low SES) were classified as average poverty campuses. Since the majority of the state is average poverty and average performance, three of the
groups had representation of over 100 campuses even after the aforementioned delineations were made. In order to narrow the campus sample size in those groups, yet maintain representation from all over the state, one campus, was randomly chosen from each ESC region. This process narrowed over 100 campuses in each of the groups down to the sample size listed below for each category.

The following names were assigned to the campus sub-sets:

Group A - Included High-poverty, high-performing campuses from a 1,601 – 10,000 student district. (7 campuses)

Group B - High-poverty, high-performing from a 10,001-99,999 student district (9 campuses). The original set was much larger for this group but was narrowed down using the process outlined above

Group C - High-poverty, low-performing from a 1,601 – 10,000 plus student district. (8 campuses)

Group D - High-poverty, low-performing from a 10,001-99,999 student district (9 campuses). The original set was much larger for this group but was narrowed down using the process outlined above

Group E - Average, high-performing from a 1,601 – 10,000 plus student district (14 campuses)

Group F - Average, high-performing from a 10,001-99,999 student district (12 campuses). The original set was much larger for this group but was narrowed down using the process outlined above

Group G - Average, low-performing from a 1,601 – 10,000 plus student district (1 campus)

Group H - Average, low-performing from a 10,001-99,999 student district (20 campuses)

After the elimination process, 81 campuses were established as the campus sample. To ensure as much representation of the entire state as possible, each of the Texas’ Education Service Center (ESC) were considered to the fullest extent possible for each group. Texas ESC’s are divided into 20 service areas. Following are the
locations of the ESC’s in Texas:

- ESC 1- Edinburg, TX. (Rio Grande Valley)
- ESC 2- Corpus Christi, TX. (Gulf Coast)
- ESC 3- Victoria, TX. (Gulf Coast)
- ESC 4- Houston, TX. (Gulf Coast)
- ESC 5- Beaumont, TX. (Gulf Coast)
- ESC 6- Huntsville, TX. (South-East)
- ESC 7- Kilgore, TX. (East)
- ESC 8- Mt. Pleasant, TX. (East)
- ESC 9- Wichita Falls, TX. (North)
- ESC 10- Richardson, TX. (DFW Metroplex)
- ESC 11- Ft. Worth, TX. (DFW Metroplex)
- ESC 12- Waco, TX. (Central)
- ESC 13- Austin, TX. (Central)
- ESC 14- Abilene, TX. (West)
- ESC 15- San Angelo, TX. (South-West)
- ESC 16- Amarillo, TX. (Far West)
- ESC 17- Lubbock, TX. (Far West)
- ESC 18- Midland, TX. (Far West)
- ESC 19- El Paso, TX. (Far West)
- ESC 20- San Antonio, TX. (South)

Some ESC regions did not have campuses that met the criteria used to reduce the campus sample. The final campus selection, however, included representation from the majority of the ESC Regions in each category. The following list outlines which ESC regions were represented from each campus group once all steps in selection occurred.

- Group A - ESC Regions 1, 13 and 16
- Group B - ESC Regions 1, 9, 10, 11, 15, 18, 19 and 20
- Group C - ESC Regions 4, 13 and 20
• Group D - ESC Regions 1, 9, 10, 11, 13, 15, 18, 19 and 20
• Group E - ESC Regions 1, 3, 4, 10, 11 and 20
• Group F - ESC Regions 1, 4, 9, 10, 11, 13, 15, 18, 19 and 20
• Group G - ESC Region 1
• Group H - ESC Regions 10, 11, 13 and 18

As evidenced from the list above, even though the campus selection was narrowed down from over 8,000 to 81, representation from the majority of the state was ultimately included in the final campus sample.

Step 2 – Campus Level Data

Once the campus sampling was established, two sets of data were requested for each campus. First, campus level financial data was requested for final reported expenditures in the Public Education Information Management System (PEIMS) for several budgetary functions in financial accounting standards. These standard categories are utilized for reporting expenditures in TEA’s financial management system. The campus level financial request was made to the state funding division of TEA for the following functions:

• 11 – Instruction- A function for which expenditures are for the purpose of directly instructing students including those enrolled in adult basic education programs
• 12 – Instructional Resources and Media Services- A function for which expenditures are directly used for establishing and maintaining libraries and other major facilities dealing with instructional materials and media
• 13 – Curriculum and Instructional Staff Development- A function for which expenditures are directly and exclusively utilized for in-service training and other staff development involving instruction or instructional related personnel of the district
• 21 – Instructional Administration- A function for which expenditures are directly tied to managing, directing and supervising general and specific instructional programs

• 23 – School Administration- A function for which expenditures are for general administration of a school campus or similar type of organizational unit. In most cases, Function Code 23 costs are limited to operating a principal’s office and include all types of activities pertaining to the operation of that office

• 31 – Guidance and Counseling Services- A function for which expenditures are directly and exclusively utilized for assessing and testing student’s abilities, aptitudes and interests; counseling students with respect to career and educational opportunities and helping them establish realistic goals

• 32 – Social Work Services- A function for which expenditures are directly and exclusively for promoting and improving school attendance of students, including the promotion of positive student and parent attitudes toward attendance

• 33 – Health Services- A function for which expenditures are directly and exclusively utilized for providing health services to individuals. Expenditures for school nurses, other medical, dental and optical services, inoculations, etc

• 95 – Payments to Juvenile Justice Alternative Education Programs- A function for which expenditures are measured for students that have been assigned to an instructional setting in an alternate education program

Texas Education Agency collapses these functions into broad categories for the purpose of analysis. The current study utilized the following categories when analyzing spending at the campus level.

• Instruction – Functions 11 and 95
• Instructional Administration – Function 21
• Support Services – Functions 31, 32 and 33

These functions were chosen because of the closest direct link of expenditures aligned to student instruction services in PEIMS coding. In addition, the following expenditure request was made:

• Total dollars spent per student, per year of the analysis
Some campuses included in the study were from districts that were considered chapter 41 or rich school districts. A key equity section in the Texas Education Code (TEC) is chapter 41. This chapter is devoted to wealth equalization through the mechanism of recapture. This process is commonly referred to as the Robin Hood plan. Chapter 41 outlines the methods the state uses to recover financial resources from districts defined as high property wealth districts. Districts that are subject to the provisions of chapter 41 must make the choice from several options in order to equalize their funding.

Those options include:

- Full consolidation with another property poor district
- Detaching and annexing territory
- Purchasing student ADA credits from another district
- Education of non-resident students
- Partial consolidation with another district

These processes equalize the amount of available dollars to spend on student instruction in school districts all over the state. The fact that Texas schools equalize funding each year is another benefit to using Texas in the current study. Campus expenditures will be analyzed in percentage of spending, per function in ratio to total budget.

In addition, this study established an adequacy threshold that aligned with current research. Prior to the 1900s, education adequacy studies were generally guided by calculating the median expenditures from districts in prior years and applying that median forward for projection. A common presumption under this methodology was that
median spending was adequate and that states should strive to bring the loser half of districts up to the median. With increased concern from state policy-makers regarding school finance, as well as increased standards with student achievement, a series of adequacy studies were commissioned throughout the nation. These studies generally analyzed the average expenditures of districts meeting a prescribed set of outcomes rather than a simple average amount. Baker, et al (2006) used a hybrid model of the various types of adequacy study methodologies to develop the amount which they believe constituted an adequate amount, per student, in Texas. By multiplying the average amount of per pupil cost in 2002 and 2004, they estimated that the per pupil cost of meeting state performance standards to be between $6,172 and $6,271 in 2004 dollars in order to achieve a 55% passing rate for all tests in Texas. This percentage was based on state requirements from that year that any academically acceptable campus must have at least 55% passing in all tests; therefore the state had determined that this was an adequate performance level. For purposes of the current study, this 2004 amount was converted to 2006 dollars by using the Consumer Price Index (Federal Reserve, 2008).

Ultimately, the Baker et al. (2006) study concluded that in 2004, Texas spent, on average, $6,503 per student, which exceeded the required amount by at least $232 per student. This would convert into $7,194 in 2008. Therefore, it was their determination that Texas was providing an adequate amount of dollars per student. This conclusion was challenged by some educational lobby groups; however, it did remain the standard that state policy-makers utilized during the 2005-06 legislative sessions.

Baker’s adequacy threshold is based on a passing rate of 55% in all tests taken
in TAKS. For the purposes of Baker’s study, this amount was considered acceptable. Most communities in Texas would not accept this passing standard. Therefore, researchers may argue that the adequacy threshold, established by Baker, is low, since the performance standards are low. Baler’s adequacy standard has been widely accepted in Texas and was therefore used in the current study.

This study used analyses based primarily on a successful schools model; however, it extended the Baker study as it looked at spending at the campus level and in different functions. Additionally, this study used the amount prescribed by the Baker study as a benchmark. All campuses in the sample exceeded the threshold set by the Baker study when spending was analyzed in the aggregate; however, this study extended the work of the Baker study by looking at expenditure patterns at the function level and not just in aggregate. Finally, the amount described as an adequate amount by Baker was used as a comparison throughout chapter 4.

Step 3 – Student Level Performance Data

After establishing the campus sample and requesting the campus-level financial information, the third and final request was for student-level performance data. To ensure accuracy in the student-level data, the request was made consistent with the TAKS Data File Format with Item Analysis. This document can be found on TEA’s website and was extremely useful in properly requesting the needed information. By requesting data from TEA in the exact format in which TEA houses the data, researchers will save time and effort. TEA uses specific codes and acronyms for particular student groups. This document contains a comprehensive listing of all codes
and acronyms. Student performance data was requested only for the initial (April) administration of the state’s annual TAKS test for the years 2003, 2004, 2005 and 2006. The state assessment calendar allows for multiple retakes. The April administration is considered the primary assessment date. The current study only used the primary assessment date (April). This process also explains why the final student sample was only 1794 students. Mplus software (www.statmodel.com) was utilized to sort and eliminate students who were not present at each April administration for sample campuses for each of the years under study. This process ensured that student growth was only measured for those students continually enrolled over the period of analysis and present on the April assessment date. In addition, the following information was requested for each of the students in the 81 campuses:

- Math scale scores for all students at Grades 3, 4, 5 and 6
- Reading scale scores at Grades 3, 4, 5 and 6
- Student ethnicity codes (i.e. African American, Anglo, Hispanic, Asian-Pacific Islander and Native American)
- Student gender
- Economic disadvantage code (Based on free and reduced lunch)
- English as a second language code (ESL)
- Students who met commended performance (defined below) standards-Math
- Students who met commended performance (defined below) standards-reading
- Only students in non-special education status
Variables

Effort was taken to increase validity by limiting and establishing the sample in a way to address specific extraneous variables which could negatively impact the validity of the study. The primary internal validity efforts which were of concern were maturation, instrumentation, statistical regression, selection-bias and experimental mortality. The primary external validity concerns were: (1) interaction effects of selection, (2) reactive effects of experimental arrangement, and (3) multiple treatment interferences (Campbell & Stanley, 1963). One of the distinct advantages of utilizing historical data from previous year students’ assessment and financial expenditure reports is the limiting effect that such a design has in regards to these validity concerns. Table 7 gives a brief definition of each validity concern and an explanation of how the current study design reduces possible negative unintended impact of each concern.

Table 8

Validity Concerns and Responses

<table>
<thead>
<tr>
<th>Validity Concern</th>
<th>Definition</th>
<th>Response of Current Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturation</td>
<td>Processes within the respondents operating as a function of the passage of time. Including growing older, hungrier, more tired.</td>
<td>By using historical data, this validity concern was minimized.</td>
</tr>
<tr>
<td>Statistical Regression</td>
<td>Operating where groups have been selected on the basis of their extreme scores</td>
<td>The use and comparison of extreme scores is part of the current studies methodology. Extreme scores were sought in the current study.</td>
</tr>
<tr>
<td>Selection Bias</td>
<td>Biases resulting in differential selection of respondents for their comparison groups</td>
<td>A great deal of effort was undertaken to ensure broad representation from the entire state. Texas is a highly diverse state.</td>
</tr>
</tbody>
</table>

(table continues)
Table 8 (continued).

<table>
<thead>
<tr>
<th>Validity Concern</th>
<th>Definition</th>
<th>Response of Current Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Mortality</td>
<td>Differential loss of respondents from the comparison group</td>
<td>The sample was structured to ensure inclusion of only students who were test takers for all years of the analysis.</td>
</tr>
<tr>
<td>Reactive Effect of Experimental Arrangement</td>
<td>Would preclude generalizations about the effects of the experimental variable upon person being exposed to it in non-experimental settings</td>
<td>By using historical data, this validity concern was minimized.</td>
</tr>
<tr>
<td>Multiple Treatment Interference</td>
<td>Likely to occur whenever multiple treatments are applied to the same respondents because the effects of prior treatments are not usually erasable (Campbell &amp; Stanley, 1963)</td>
<td>By using historical data, this validity concern was eliminated.</td>
</tr>
</tbody>
</table>

Dependent Variable

The current study was conducted at the district, campus and individual student levels. The dependent variable was the scale score in reading and math on the Texas Assessment of Knowledge and Skills (TAKS) over the years 2003, 2004, 2005 and 2006. The TAKS test is a comprehensive criterion reference assessment based on the Texas Essential Knowledge and Skills (TEKS), the state standardized curriculum. The current study analyzed results from:

- Grade 3 – Reading and Math
- Grade 4 – Reading and Math
- Grade 5 – Reading and Math
- Grade 6 – Reading and Math
In addition to comparisons of student performance at the meeting minimum expectation level, student results were also analyzed by comparing students from low-socioeconomic status, ethnicity and gender to the various means. This process allowed for research questions to be analyzed more specifically than simply reviewing all students meeting minimum expectations.

The current study dropped from the sample, all students who were not present for all four years of the TAKS assessment, at the same campus. This step was undertaken in order to strengthen the validity of correlation analysis. The fact that over 8,000 students became 1,796 students (after this step) indicates that there was a high percentage of mobility over the four years of study. Another factor that could impact this reduction is absenteeism. Whereas the purpose of the current research was not study of mobility, it could become an important topic to study further. Mobility is projected to increase in the state of Texas (Murdoch, 2002).

Independent Variables

The independent variables included several variations in which campus expenditures were analyzed. These variables were chose because they include expenditures that are most closely aligned with what is considered direct instruction spending. The independent variables included:

- Total campus dollars expended in TEA functions 11, 12, 13, 21, 23, 31, 32, 33, and 95
- Percentage of students from low SES
- Percentage of students from student subpopulations: Hispanic, Anglo, African American, Asian-Pacific Islander and Native American
Procedures for Analyzing Data

The independent variables were examined for 2003, 2004, 2005 and 2006. In order to successfully model different patterns of growth between various sub-groups, a latent growth mixture model for continuous outcomes was undertaken using the Mplus software. This model allowed for identification of unobserved discrete sub-groups to be analyzed within the total population studied. The state data were adjusted via multiple regressions to account for the fact that state standardized assessments were normed at the specific grade level and were not linked from year to year. This was problematic at both the state and national level. This study employed multiple regression to predict the future scores, and then subtracted the actual score obtained from the predicted score providing a measure utilized as an indicator of growth each year.

The current study analyzed a considerable amount of data. Muthén (1992) explained some of the benefits using a latent variable model (also referred to as growth mixture modeling (GMM)) in similar educational research. According to Muthén, many of the values of predictor variable values are said to be latent, or hidden. If latent variables are not carefully dealt with, they can possibly distort conclusions. Muthén asserted that latent variable modeling is emerging as a useful technique for substantially avoiding such distortions. In order to deal with possible distortions, more traditional research has simply limited independent variables. By using latent growth modeling, researchers are able to avoid this type of limitation. At the same time, GMM allows for increased
sensitivity to the research question by using multiple indicators without fear of loss of
meaning. Latent variable modeling is useful in research situations where random or
systematic measurement error could present a problem, where phenomena under study
are potentially not directly observed and/or where multiple indicators are needed to
describe various aspects of a phenomenon (Muthén, 1992). Each of these three issues
are applicable to the current study, and latent variable modeling assists greatly in
allowing the sample size to stay large while still being able to draw generalizable
conclusions.

Muthén and Khoo (1998) further outlined additional benefits of using latent
variable modeling in analysis of longitudinal studies of achievement. They stated that
educational studies were often used to answer questions regarding educational
progress or potential obstacles to such progress; and typically, longitudinal data with
repeated measurements on a set of individuals provides information for answering such
educational research questions. However, traditional methods for modeling individual
differences in growth had problems in addressing unconformity of data and/or missing
data. Emerging latent variable technology had proven successful in addressing the
complexities of multivariable data associated with educational studies (Muthén and
Khoo, 1998). Statistically, the growth model, using latent variable technology is a
multilevel model; in that an individual observation over time is correlated, and individual
variation in growth parameters in terms of person-specific, time-invariant covariates is
an integral part of the model. Therefore, the statistical developments drawn from growth
modeling extend beyond conventional structural equation modeling of longitudinal data
in its ability to explain complex data (Wheaton, Muthén, Alwin & Summers, 1977).
Muthén and Khoo (1998) used data from the National Science Foundation (NSF) as an example for demonstration of benefits of GMM. The Longitudinal Study of American Youth (LSAY) was a national study of performance in and attitudes towards science and mathematics. In terms of the LSAY math achievement example, they used the following formula(s) to explain the difference between growth modeling and traditional research models: Achievement score = $Y_{it}$ for individual $i$ at the point in time $t$, with $t$ corresponding to different grade levels. In this example, it was convenient to set $t = 0$ for the lowest grade. The growth model was specified as: $Y_{it} = A_i + B_i t + S_{it}$

$A_i$ and $B_i$ were individual-specific parameters describing achievement (initial) and the rate of achievement growth. $S_{it}$ represented time-varying residuals. The regression intercept and slopes were random parameters that could vary over individuals. This was illustrated in the following manner for three individuals.

Individual $i$ at time $t$:

$$Y_{it} = A_i + B_i t + S_{it}$$

![Figure 1. Regression intercept and slope.](image)

In this illustration, $A_i$ and $B_i$ are individual-specific parameters describing initial level of achievement growth and $S_{it}$ represents the time varying residuals. The regression intercept and slopes are random parameters that vary for individuals.
According to the model, the statistical advantage of growth modeling is that in any given application, it is not necessary that both the intercept and the slope are random, but one of the two can be fixed. Typically, repeated measure random effects ANOVA, uses a random intercept only model to describe the correlation among the observations over time for a given individual. In growth modeling, the specification of linear growth is not necessary (Muthén & Muthén, 1998). The degree of non-linearity in the growth curve can be inferred whenever there are sufficient data on other points in time. Ideally, there will be at least four points in time. This predictive effect is one of the most dramatic advantages of growth modeling (Muthén & Muthén, 1998).

In order to address potential missing or latent (hidden) data, the growth mixture model imposes a structure on the mean. In a growth model, without covariates, two parameters can be used to explain the progression of the observed mean. For example, these parameters can be named $A$ and $B$. $A_i$ and $B_i$ can be viewed as latent variables instead of random parameters. Both latent variables are unobserved $i.i.d.$ (independently and identically distributed) variables varying across individuals. By extending the earlier example: $Y_{it}=A_i+B_{it}+S_{it}$, $t$ does not vary over individuals because all students are in the same grade at a given testing occasion and $t$ can be considered a fixed regression parameter for the variable $B_i$. Estimation of this parameter can be accomplished by fixing the first two $t$ values and therefore capturing non-linear growth. It may also be of interest to simultaneously analyze growth in several populations. For example males and females may be seen as representing different growth curves if a study possesses two cohorts and male and female are of interest to each cohort. A four group analysis is to be utilized for various hypotheses of invariance against gender. In
order to accomplish a multi-group analysis, the following steps occur:

(1) Once full invariance across gender of the growth model parameters is imposed, the model can be tested against a no-gender invariance by subtracting the sum of the degrees of freedom and chi-square values obtained in the two gender-specific analyses

(2) If non-invariance is found, sources of non-invariance may be further investigated in three ways

(2a) The invariance may be relaxed for the marginal part of the model

(2b) The invariance of the growth model residual variance may be relaxed. This involves the variances remaining when conditioning of the covariates, namely the initial status and growth rate residuals and variances of achievement score residuals

(2c) The invariance may be relaxed on the growth model’s conditional mean(s), given the covariates (growth rate intercept and $y$ intercept) (Muthén and Khoo, 1998).

The following graphic representation of the growth model gives an example with test scores $y$ from four points in time (four grade levels) with one time-variant covariant $w$. The latent variable of initial status is denoted $i$ (intercept) and the latent variable of growth rate is denoted $s$ (slope).

![Graphical representation of a growth model for four time points.](image)

*Figure 2. Graphical representation of a growth model for four time points.*
The advantage to utilizing Mplus software comes from its ability to discern between seemingly unlike items. This additional benefit is represented graphically in Figure 3.

Figure 3. Graphical representations for four points in time with covariates.

In this example, \( x \) represents the covariate (dependent variable plus selected independent variables); \( x \) becomes the predictor that Mplus uses to infer \( c \); \( c \) represents the classification based on inference which allows for comparison of latent (or hidden) variables; \( i \) represents intercept and \( s \) represents slope. \( Y1 \) represents the results in math and reading for years: 02-03, \( Y2 \) for 03-04, \( Y3 \) for 04-05 and \( Y4 \) for 05-06. By utilizing Mplus, analysis was made for each year’s expenditures in relationship to each year’s student performance results. As explained earlier in chapter 3, both percentage of and total dollars spent, per student, were considered. Not only can growth mixture model compare like-items, it can compare \textit{unlike} items to one another over time based
on inferences made. This capability of inference is one of the major benefits of Mplus software (latent growth modeling).

The current research study utilized growth modeling using latent variables. The growth modeling was carried out using latent variable structural equation modeling computer software, Mplus (Muthén & Muthén, 1998). As with any research methodology potential problems do exist. Researchers using Mplus may neglect to scrutinize raw data with respect to the shape of individual growth curves and outliers. In other cases, there may be competing models which fit the means and covariances roughly the same but may lead to different data interpretations. The problem of scale changes over time due to updates in content is a problem; however, this is a problem with most all types of methodologies.

Despite these potential issues, there are multiple benefits. Growth modeling can quantify the amount of individual differences in growth in what appear to be sometimes seemingly insignificant mean difference, yet still drawing statistical significance. Growth modeling can readily relate individual variations to background variables. Additionally, growth modeling, in a latent variable analysis framework, makes possible a very clear and flexible analysis. This model allows for broad generalizations of the base comparison(s) using multiple indicators and measures that are non continuous, normal (binary) variables (Muthén, 1983).

Due to the size and multivariate nature of the current research study, latent growth modeling was utilized. The latent growth mixture model assisted tremendously in that it allowed for the analysis and comparison of established sub-groups A-H discussed earlier. Because of this ability, the expenditure patterns were able to be carefully
analyzed between and among each of the groups: From high-poverty, average-poverty, high-performance and low-performance.

In addition to the comparison of each of the established groups, other patterns of extraneous factors such as impact of ethnicity, gender and age were evaluated. The latent growth mixture model as applied through Mplus software allowed for the emergence of patterns within the sampling. Table 9 outlines unique features and comparative advantages of Mplus software over more traditional models.

Table 9

Summary of Related Studies

<table>
<thead>
<tr>
<th>Unique Feature of Mplus:</th>
<th>Benefit over traditional software:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to build models with dichotomous and ordered categorical outcome variables.</td>
<td>Inability to use continuous latent variables to represent factors corresponding to unobserved constructs.</td>
</tr>
<tr>
<td>Capacity to build models that contain categorical latent (hidden) variables.</td>
<td>Inability to analyze for missing and complex survey data.</td>
</tr>
<tr>
<td>Optimal full information maximum likelihood (FIML) regarding handling missing data for both exploratory as well as confirmatory factor analysis (CFA) and structural equation modeling (SEM).</td>
<td>Inability to use categorical latent variables to represent latent classes which correspond to homogenous groups.</td>
</tr>
<tr>
<td>Ability to fit multilevel or hierarchical CFA and SEM models.</td>
<td></td>
</tr>
</tbody>
</table>

(Duncan, Duncan, Strycker and Li, 2002)

Summary

The selected methodology for this study was relatively unique. The development of the methodology was modeled to a large extent after classic production-function models, however, at the same time the analysis narrowed the scope of the sample to
simulate Picus’ (2004) successful school model, in which the methodology was used to determine the difference in how successful and unsuccessful schools allocated resources. Whereas the sample was narrowed in scope from over 8,000 campuses, the overall sample size was intentionally left relatively large in number of total schools and number of students. It was important to the outcome of the study to ensure the ability to generalize findings by including a large, widely-representative sampling from the highly diverse state of Texas.

TAKS Reading and Math were selected for dependent variables because they represent test results from a majority of the Texas student population. The TAKS test plays a major role in the Texas accountability system and therefore made a valid measurement of student success. The addition of using Mplus made the TAKS results more useful to the current study. TAKS results are generally a measure of the state curriculum at a snapshot in time. Mplus allowed for the TAKS data to demonstrate student longitudinal growth by comparing the same student at four points in time.

The independent variables were centered on the financial function codes associated with Texas’ financial management system as reported in annual PEIMS reports. Functions were chosen that most closely aligned with what is considered direct instruction functions. Trends were analyzed by utilizing Mplus software. This statistical software allowed for analysis of latent growth-mixtures as well as unpredicted patterns. Results of these analyses and application to the research questions are reported in chapter 4.
CHAPTER 4

RESULTS

Although previous studies have explored the relationship between expenditures and student achievement, most research has examined aggregate spending and aggregate student achievement at campus and district levels. Furthermore, previous research on the topic of district resources’ impact on student achievement has provided mixed results. Due to the current focus and demand for increased student achievement and mixed results of research related to resource allocation, the investigation of how district expenditures affect individual student achievement is of increasing importance.

Purpose

The purpose of the current study was to examine the relationships, if any, among district expenditure patterns, campus characteristics, and student achievement. Because districts and campuses determine what percentages of their operating budgets are allocated to various functions, it is expected that patterns in spending may affect student achievement in predictable ways. In order to substantiate the existence of an effect of expenditure patterns on student achievement, a longitudinal design was employed in which student math and reading scores were assessed over four school years: 2002-2003 through 2005-2006. Three categories of campus/district expenditures were examined that included expenditures in instruction, instructional administration, and support services (e.g., guidance and counseling, social work, and health services). Other independent variables included three campus characteristics: district size, performance rating, and percentage of economically disadvantaged students served.
The longitudinal measures of student achievement include adjusted scale scores for math and reading, as assessed by the Texas Assessment of Knowledge and Skills (TAKS). For the purposes of this study, only math and reading in grades three through six were examined because these courses are consistently offered in public schools across the state of Texas.

As mentioned in Chapter 3, Baker et al. (2006) concluded that in the year 2004, Texas spent on average $6,503 per student, which exceeded the required amount by at least $232 per student. This would convert into $7,194 in 2008. Therefore, it was their determination that Texas was providing an adequate amount of dollars per student.

This study used analyses based primarily on a successful schools model; however, it extended the Baker study as it looked at spending at the campus level and in different functions. Additionally, this study used the amount prescribed by the Baker study as a benchmark. All campuses in the sample exceeded the threshold set by the Baker study when spending is analyzed in the aggregate; however, this study extended the work of the Baker study by looking at expenditure patterns at the function level and not just in aggregate.

Descriptive statistics of the aforementioned variables were conducted in SPSS™. To examine the impact of expenditure patterns on student achievement over time, Mplus 4.2 was used to determine how well a two-level growth model fit the four-year continuous outcomes in math and reading. This chapter presents the results of the study organized by the following research questions.

---

1 SPSS Inc., [http://www.SPSS.com](http://www.SPSS.com)
Research Questions

1. What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in reading for K-12 public school districts in Texas?

2. What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in math for K-12 public school districts in Texas?

3. What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in reading for K-12 public school districts in Texas?

4. What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in math for K-12 public school districts in Texas?

5. What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in reading for K-12 public school districts in Texas?

6. What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in math for K-12 public school districts in Texas?

Descriptive statistics are reported first on relevant variables followed by the inferential tests selected to assess the specific research questions. That is, a latent growth model was used to assess the impact of expenditure patterns on math and reading scores over time. Each of the six questions that guided the study were answered separately. Therefore, intraclass correlation tables and results for the growth model will be presented for each question, for both reading and math achievement since each question was treated independently. The descriptive measures for the dependent variables are reported first. The difference in the number of participants in reading and math is primarily due to exemptions allowed in Texas for students who are classified as special education.
Table 10

*Mean and Standard Deviation for Reading Achievement*

<table>
<thead>
<tr>
<th>Students</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 2002-03</td>
<td>1,796</td>
<td>2,275.81</td>
<td>3.959</td>
</tr>
<tr>
<td>Reading 2003-04</td>
<td>1,796</td>
<td>2,258.48</td>
<td>4.079</td>
</tr>
<tr>
<td>Reading 2004-05</td>
<td>1,796</td>
<td>2,239.04</td>
<td>4.347</td>
</tr>
<tr>
<td>Reading 2005-06</td>
<td>1,796</td>
<td>2,372.75</td>
<td>4.521</td>
</tr>
</tbody>
</table>

Table 11

*Mean and Standard Deviation for Math Achievement*

<table>
<thead>
<tr>
<th>Students</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2002-03</td>
<td>2,202</td>
<td>2,231.01</td>
<td>3.702</td>
</tr>
<tr>
<td>Math 2003-04</td>
<td>2,213</td>
<td>2,246.90</td>
<td>3.746</td>
</tr>
<tr>
<td>Math 2004-05</td>
<td>2,102</td>
<td>2,314.45</td>
<td>4.325</td>
</tr>
<tr>
<td>Math 2005-06</td>
<td>2,224</td>
<td>2,336.55</td>
<td>4.509</td>
</tr>
</tbody>
</table>

Expenditure Patterns and Student Achievement

*Descriptive Results for Independent Variables*

The descriptive measures for the independent variables are reported below.

Table 12 provides the means and standard deviations of the percentages of the campus budget expended in the areas of instruction (Function 11), instructional leadership/administration (Function 21) and support services (Functions 31, 32 and 33) for the time frame of the study. As one would suspect per State of Texas mandate, the
majority of these monies were allocated specifically for instructional purposes (72%). State rules now mandate that all Texas schools maintain 65% in these categories.

Table 12

*Descriptive Statistics for Independent Variables*

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction (Function 11)</td>
<td>1796</td>
<td>72.13</td>
<td>3.08</td>
</tr>
<tr>
<td>Instructional leadership/administration (Function21)</td>
<td>1796</td>
<td>1.5289</td>
<td>0.77641</td>
</tr>
<tr>
<td>Support services (functions 31, 32 and 33)</td>
<td>1796</td>
<td>4.7739</td>
<td>1.10541</td>
</tr>
</tbody>
</table>

Due to the nature of SES, gender and ethnicity being categorical variables, frequencies and percentages were utilized to provide insight into the distribution of these variables in Table 13. Regarding Table 13, 42.4% of the students were identified as economically disadvantaged, 52.5% were male, 47.5% were female, and the ethnic composition of student sample was generally representative of the State with a slight underrepresentation of African American students as compared to the 2005-2006 AEIS Snapshot (Texas Education Agency, Snapshot, 2006).

Table 13

*Descriptive Statistics for SES, Gender and Ethnicity*

<table>
<thead>
<tr>
<th>Economically Disadvantaged (SES)</th>
<th>Frequency</th>
<th>%</th>
<th>State Average 2005-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free and Reduced</td>
<td>760</td>
<td>42.4</td>
<td>55.5</td>
</tr>
<tr>
<td>Have never qualified for low SES</td>
<td>1034</td>
<td>57.6</td>
<td>Not available</td>
</tr>
<tr>
<td>Total</td>
<td>1794</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

*(table continues)*
Table 13 (continued).

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>%</th>
<th>State Average 2005-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>943</td>
<td>52.5</td>
<td>Not available</td>
</tr>
<tr>
<td>Male</td>
<td>853</td>
<td>47.5</td>
<td>Not available</td>
</tr>
<tr>
<td>Total</td>
<td>1796</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
<td>0</td>
<td>AEIS reports other as 3.6</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>26</td>
<td>1.4</td>
<td>AEIS reports other as 3.6</td>
</tr>
<tr>
<td>African American</td>
<td>110</td>
<td>6.1</td>
<td>14.4</td>
</tr>
<tr>
<td>Hispanic</td>
<td>842</td>
<td>46.9</td>
<td>46.3</td>
</tr>
<tr>
<td>White</td>
<td>816</td>
<td>45.4</td>
<td>35.7</td>
</tr>
<tr>
<td>Total</td>
<td>1794</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**Bivariate Relationships among Dependent and Independent Variables**

Spearman rho correlation coefficients were computed among the variables. Table 14 indicated that statistically significant correlations ranged from $R = -0.051$, $p < 0.01$ between math and percentage spent on instruction, and $r = -0.139$, $p < 0.01$ between reading and percentage spent on instruction. The effect size indices indicate 0.00 overlapping variance between math and expenditures and 0.02 overlapping variance between reading and expenditures.

Correlations between reading scores and expenditures were slightly stronger than the correlations between math scores and expenditures. The correlations between the achievement scores and the remaining expenditures (percentages spent on instructional administration and support services) are also statistically significant; however, their magnitudes have no practical significance. An explanation for the finding of statistical significance with these variables is due in part to the large sample size (Cohen 1988; Thompson, 1996).
Table 14

Spearman rho Correlation among Reading, Math, and Expenditure Percentages

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 02-03 (1)</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading 03-04 (2)</td>
<td>0.654**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading 04-05 (3)</td>
<td>0.652**</td>
<td>0.716**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading 05-06 (4)</td>
<td>0.617**</td>
<td>0.667**</td>
<td>0.659**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 02-03 (5)</td>
<td></td>
<td>0.592**</td>
<td>0.608**</td>
<td>0.617**</td>
<td>0.845**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 03-04 (6)</td>
<td>0.406**</td>
<td>0.442**</td>
<td>0.440**</td>
<td>0.622**</td>
<td>0.650**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 04-05 (7)</td>
<td>0.382**</td>
<td>0.413**</td>
<td>0.447**</td>
<td>0.591**</td>
<td>0.614**</td>
<td>0.682**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 05-06 (8)</td>
<td>0.387**</td>
<td>0.429**</td>
<td>0.415**</td>
<td>0.634**</td>
<td>0.627**</td>
<td>0.650**</td>
<td>0.683**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% on Instruction (9)</td>
<td>-0.081**</td>
<td>-0.077**</td>
<td>-0.128**</td>
<td>-0.139**</td>
<td>-0.051*</td>
<td>-0.075**</td>
<td>-0.088**</td>
<td>-0.068**</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% on Instr. Leadership (10)</td>
<td>-0.129**</td>
<td>-0.075**</td>
<td>-0.134**</td>
<td>-0.106**</td>
<td>-0.067**</td>
<td>-0.030</td>
<td>-0.076**</td>
<td>-0.018</td>
<td>0.029</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>% on School Support (11)</td>
<td>-0.030</td>
<td>-0.028</td>
<td>-0.016</td>
<td>-0.002</td>
<td>0.0044</td>
<td>0.062*</td>
<td>0.011</td>
<td>0.057*</td>
<td>-0.023</td>
<td>0.034</td>
<td>1.00</td>
</tr>
</tbody>
</table>
The Pearson correlations in Table 15 indicate that correlations ranged between $r_{pb} = -0.321$, $p < 0.001$ between SES and reading achievement 2005-2006 and $r_{pb} = -0.236$, $p < 0.001$ between SES and math achievement 2003-04 and 2005-06. The Pearson results of each of these relationships are negative, indicating that students from districts with high economic disadvantage tended to score significantly lower on both reading and math achievement tests. Again, correlations between reading and SES were stronger than the correlations between math and SES. The practical significance or effect size between reading and SES was $r^2 = 0.07$ to $r^2 = 0.10$. The effect size between math and SES was $r^2 = 0.06$ to $r^2 = 0.07$. Taken together, on average, SES accounted for 9% of the variation in reading performance, whereas it accounted for only 6% of the variation in math performance. It is important to remember that an existing correlation does not equal causation. These statistical significant findings may have been the result of a large sample (Cohen 1988; Thompson, 1996).

Table 15

<table>
<thead>
<tr>
<th>Subject</th>
<th>% Economically Disadvantaged (SES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 02-03</td>
<td>-0.272**</td>
</tr>
<tr>
<td>Reading 03-04</td>
<td>-0.298**</td>
</tr>
<tr>
<td>Reading 04-05</td>
<td>-0.301**</td>
</tr>
<tr>
<td>Reading 05-06</td>
<td>-0.321**</td>
</tr>
<tr>
<td>Math 02-03</td>
<td>-0.273**</td>
</tr>
<tr>
<td>Math 03-04</td>
<td>-0.236**</td>
</tr>
<tr>
<td>Math 04-05</td>
<td>-0.265**</td>
</tr>
<tr>
<td>Math 05-06</td>
<td>-0.236**</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2 tailed)
Research Question 1:

What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in reading for K-12 public school districts in Texas?

Examination of Percentage Spent on Instruction and Reading Achievement

Students from districts that spent more on instruction scored lower on reading than their grade peers in districts that spent less on instruction. Additionally, these students’ reading scores decreased over time, although the rate of the decrease was not statistically significant, $t = -1.946, p > .05$.

Multilevel Growth Model for Reading

In this particular data set there were 75 districts (clusters), providing an average number of students examined per district (cluster) of 23.92, resulting in 1,794 students (observations). Intraclass correlations among the dependent reading variables reported in Table 16 range from 0.077 to 0.109. The results indicated that a multilevel model was appropriate for the analysis to account for the variation in the level-two clusters (Byrk & Raudenbush, 1992). According to Byrk and Raudenbush (1992), interclass correlations (ICC) greater than or equal to 0.05 warrant a two-level model.

Table 16

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraclass Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 2002-03</td>
<td>0.098</td>
</tr>
<tr>
<td>Reading 2003-04</td>
<td>0.077</td>
</tr>
<tr>
<td>Reading 2004-05</td>
<td>0.109</td>
</tr>
<tr>
<td>Reading 2005-06</td>
<td>0.104</td>
</tr>
</tbody>
</table>
The resulting multilevel growth model for reading achievement fit the data well according to the Confirmatory Fit Index (CFI) which equaled 0.98. According to Bentler (1989) and Kaplan (2000), for a model to fit the data well, the CFI should range between 0.97 and 1.0, with 1.0 being a perfect fit. In addition, the root mean square error of approximation (RMSEA) was 0.04, which further emphasizes the adequacy of the model. According to Kaplan (2000), adequate RMSEA should range from 0.0 to 0.06 which is indicative of a good model fit.

Results for the Multilevel Growth Model for Reading

The parameter estimates, standard errors, t-statistics and p-values are reported in Table 17. The results of the within portion of the multilevel growth model displayed in Table 17 indicated that students who were economically disadvantaged began approximately 0.069 points lower than those not classified as economically disadvantaged (intercept = -.069). Furthermore, these same students lost about 0.005 points per year on average (slope = -.005). The covariance between the slope and the intercept is negative, indicating that those students who have a higher rate on reading scores tend to decrease their scores on reading achievement over time. In the between portion of the model, the effects of each of the expenditures on reading achievement is assessed. Students from districts that spent more on instruction score lower on reading than their grade peers in districts that spent less on instruction. Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, $t = -1.946$, $p > .05$. 
Table 17

*Result of Multilevel Model for Reading and Instruction*

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>Est/S.E.</th>
<th>Cl-95%</th>
<th>Clψ U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercept On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.069*</td>
<td>0.007</td>
<td>-9.353</td>
<td>-0.083</td>
<td>-0.054</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.265*</td>
<td>0.047</td>
<td>5.682</td>
<td>0.173</td>
<td>0.356</td>
</tr>
<tr>
<td><strong>Slope On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.005*</td>
<td>0.002</td>
<td>-2.607</td>
<td>-0.009</td>
<td>-0.001</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.018</td>
<td>0.008</td>
<td>-2.218</td>
<td>-0.035</td>
<td>-0.002</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>-0.010</td>
<td>0.007</td>
<td>-1.419</td>
<td>-0.025</td>
<td>0.004</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Between Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercept On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction</td>
<td>-0.025*</td>
<td>0.011</td>
<td>-2.374</td>
<td>-0.046</td>
<td>-0.004</td>
</tr>
<tr>
<td><strong>Slope On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction</td>
<td>-0.006</td>
<td>0.003</td>
<td>-1.946</td>
<td>-0.011</td>
<td>0.00</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>-0.004</td>
<td>0.002</td>
<td>-1.566</td>
<td>-0.008</td>
<td>0.001</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All campuses in the sample exceeded the threshold of $7,194 per student in the year 2008 (adjusted for inflation), set by the Baker study (Baker, 2006).

**Research Question 2:**

What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in math for K-12 public school districts in Texas?

**Examination of Percentage Spent on Instruction and Math Achievement**

In summary, there are no predictable relationships between how district’s spent funds in areas of instruction, instructional administration, and support services and their students’ math achievement scores over the time period of this study when variance due to SES was controlled. In other words, these expenditure categories have no
impact on the students’ starting points or their growth in math achievement over time.

**Multilevel Growth Model for Math Achievement**

In this data set, there are 73 districts (clusters), providing an average number of students examined per district of 23.41 resulting in 1,709 total students (observations). Intraclass correlations among the math variables reported in Table 18 range from 0.06 to 0.10. Intraclass correlations greater than or equal to 0.05 warrant a two-level model. The results of this analysis indicate that a multilevel model is appropriate for these data.

Table 18

**Intraclass Correlations for Math by Year**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraclass Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2002-03</td>
<td>0.103</td>
</tr>
<tr>
<td>Math 2003-04</td>
<td>0.093</td>
</tr>
<tr>
<td>Math 2004-05</td>
<td>0.076</td>
</tr>
<tr>
<td>Math 2005-06</td>
<td>0.062</td>
</tr>
</tbody>
</table>

Similar to the multilevel model for reading, the resulting multilevel growth model for math fit the CFI which equal 0.96 with a range between. In addition, the root mean square error of approximation (RMSEA) is 0.06 with a RMSEA of 0.0 to 0.06 being the measure of good model fit (Bentler, 1989; Kaplan, 2000).

**Results for the Multilevel Growth Model for Math Achievement**

The parameter estimates, standard errors, t-statistics and p-values are reported in Table 19. In the within portion of the growth model (student level), economically
disadvantaged students start out in grade 3 with significantly lower math scores (intercept = -.062) than their higher SES peers and demonstrate significant decreases in math achievement over the four-year period (slope = -.008). Unlike reading achievement, the covariance between the slope and intercept is positive (0.006), meaning that students who score higher on math increased their scores at a faster rate over the four years.

Table 19

Result of Multilevel Model for Math and Instruction

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>Est/S.E.</th>
<th>CI-95%</th>
<th>CIΨ U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.062*</td>
<td>0.006</td>
<td>-10.824</td>
<td>-0.074</td>
<td>-0.051</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.176*</td>
<td>0.060</td>
<td>2.947</td>
<td>0.059</td>
<td>0.292</td>
</tr>
<tr>
<td>Slope On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.008*</td>
<td>0.002</td>
<td>-4.083</td>
<td>-0.012</td>
<td>-0.004</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.022*</td>
<td>0.009</td>
<td>-2.467</td>
<td>-0.040</td>
<td>-0.005</td>
</tr>
<tr>
<td>Slope with Intercept (covariance)</td>
<td>0.006</td>
<td>0.006</td>
<td>0.881</td>
<td>-0.007</td>
<td>0.018</td>
</tr>
<tr>
<td><strong>Between Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction</td>
<td>-0.019</td>
<td>0.011</td>
<td>-1.657</td>
<td>-0.041</td>
<td>0.003</td>
</tr>
<tr>
<td>Slope On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction</td>
<td>0.001</td>
<td>0.003</td>
<td>0.269</td>
<td>-0.005</td>
<td>0.007</td>
</tr>
<tr>
<td>Slope with Intercept (covariance)</td>
<td>-0.020</td>
<td>0.005</td>
<td>-3.755</td>
<td>-0.031</td>
<td>-0.010</td>
</tr>
</tbody>
</table>

All campuses in the sample exceeded the threshold of $7,194 per student in the year 2008 (adjusted for inflation), set by the Baker study (Baker, 2006).

Research Question 3:

What is the relationship between expenditures on instructional leadership/administration
In summary, the results of this question indicate that those students who have a higher rate on reading scores tend to decrease their scores on reading achievement over time. The effects of each of the expenditures on reading achievement indicate that students from districts that spend more on instructional leadership score lower on reading than their grade peers in districts that spend less. Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, $t = .137, p > .05$.

**Multilevel Growth Model for Reading**

In this particular data set there are 75 districts (clusters), providing an average number of students examined per district (cluster) of 23.92, resulting in 1,794 students (observations). Intraclass correlations among the dependent reading variables in Table 20 range from 0.077 to 0.109. The results indicate that a multilevel model is appropriate for the analysis to account for the variation in the level-two clusters (Byrk & Raudenbush, 1992). According to Byrk and Raudenbush (1992), interclass correlations (ICC) greater than or equal to 0.05 warrant a two-level model.

Table 20

**Intraclass Correlations for Reading by Year**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraclass Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 2002-03</td>
<td>0.098</td>
</tr>
<tr>
<td>Reading 2003-04</td>
<td>0.077</td>
</tr>
<tr>
<td>Reading 2004-05</td>
<td>0.109</td>
</tr>
<tr>
<td>Reading 2005-06</td>
<td>0.104</td>
</tr>
</tbody>
</table>
The resulting multilevel growth model for reading achievement fit the data well according to the confirmatory fit index (CFI) which equals 0.98. According to Bentler (1989) and Kaplan (2000), for a model to fit the data well, the CFI should range between 0.97 and 1.0, with 1.0 being a perfect fit. In addition, the root mean square error of approximation (RMSEA) is 0.04, which further emphasizes the adequacy of the model. They further note that an adequate RMSEA should range from 0.0 to 0.06 which is indicative of a good model fit.

Results for the Multilevel Growth Model for Reading

The parameter estimates, standard errors, \( t \)-statistics and \( p \)-values are reported in Table 21. The results of the within portion of the multilevel growth model displayed in Table 21 indicates that students who are economically disadvantaged began approximately 0.069 points lower than those not classified as economically disadvantaged (intercept = -.069). Furthermore, these same students lose about 0.005 points per year on average (slope = -0.005). The covariance between the slope and the intercept is negative, indicating that those students who have a higher rate on reading scores tend to decrease their scores on reading achievement over time. In the between portion of the model, the effects of each of the expenditures on reading achievement is assessed. Students from districts that spend more on instructional leadership/administration score lower on reading than their grade peers in districts that spend less on instruction. Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, \( t = .137, p > .05 \).
Table 21

*Result of Multilevel Model for Reading and Instructional Leadership/Administration*

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>Est/S.E.</th>
<th>CI-95%</th>
<th>CIψ U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercept On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.069*</td>
<td>0.007</td>
<td>-9.353</td>
<td>-0.083</td>
<td>-0.054</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.265*</td>
<td>0.047</td>
<td>5.682</td>
<td>0.173</td>
<td>0.356</td>
</tr>
<tr>
<td><strong>Slope On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.005*</td>
<td>0.002</td>
<td>-2.607</td>
<td>-0.009</td>
<td>-0.001</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.018</td>
<td>0.008</td>
<td>-2.218</td>
<td>-0.035</td>
<td>-0.002</td>
</tr>
<tr>
<td>Slope with Intercept (covariance)</td>
<td>-0.010</td>
<td>0.007</td>
<td>-1.419</td>
<td>-0.025</td>
<td>0.004</td>
</tr>
<tr>
<td><strong>Between Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercept On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Leadership-Admin</td>
<td>0.009</td>
<td>0.046</td>
<td>0.190</td>
<td>-0.081</td>
<td>0.098</td>
</tr>
<tr>
<td><strong>Slope On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Leadership-Admin</td>
<td>0.001</td>
<td>0.009</td>
<td>0.137</td>
<td>0.017</td>
<td>0.019</td>
</tr>
<tr>
<td>Slope with Intercept (covariance)</td>
<td>-0.004</td>
<td>0.002</td>
<td>-1.566</td>
<td>-0.008</td>
<td>0.001</td>
</tr>
</tbody>
</table>

All campuses in the sample exceeded the threshold of $7,194 per student in the year 2008 (adjusted for inflation), set by the Baker study (Baker, 2006).

**Research Question 4:**

What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in math for K-12 public school districts in Texas?

In summary, there are no predictable relationships between how districts spend funds in the areas of instructional administration, and students’ math achievement scores over the time period of this study when SES is controlled. These expenditure categories have no impact.
Multilevel Growth Model for Math Achievement

In this data set, there are 73 districts (clusters), providing an average number of students examined per district of 23.41 resulting in 1,709 total students (observations). Intraclass correlations among the math variables reported in Table 22 range from 0.06 to 0.10. As stated earlier, ICCs greater than or equal to 0.05 warrant a two-level model. The results of this analysis indicated that a multilevel model is appropriate for these data.

Table 22

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraclass Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2002-03</td>
<td>0.103</td>
</tr>
<tr>
<td>Math 2003-04</td>
<td>0.093</td>
</tr>
<tr>
<td>Math 2004-05</td>
<td>0.076</td>
</tr>
<tr>
<td>Math 2005-06</td>
<td>0.062</td>
</tr>
</tbody>
</table>

Similar to the multilevel model for reading, the resulting multilevel growth model for math fit the CFI which equal 0.96 with a range between. In addition, the root mean square error of approximation (RMSEA) is 0.06 with a RMSEA of 0.0 to 0.06 being the measure of good model fit (Bentler, 1989; Kaplan, 2000).

Results for the Multilevel Growth Model for Math Achievement

The parameter estimates, standard errors, t-statistics and p-values are reported in Table 23. In the within portion of the growth model (student level), economically disadvantaged students start out in grade 3 with significantly lower math scores (intercept = -.062) than their higher SES peers and demonstrate significant decreases in
math achievement over the four-year period (slope = -.008). Unlike reading achievement, the covariance between the slope and intercept is positive (0.006), meaning that students who score higher on math increase their scores at a faster rate over the four years.

Table 23

*Result of Multilevel Model for Math and Instructional Leadership/Administration*

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>Est/S.E.</th>
<th>CI-95%</th>
<th>Clψ U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercept On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.062*</td>
<td>0.006</td>
<td>-10.824</td>
<td>-0.074</td>
<td>-0.051</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.176*</td>
<td>0.060</td>
<td>2.947</td>
<td>0.059</td>
<td>0.292</td>
</tr>
<tr>
<td><strong>Slope On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.008*</td>
<td>0.002</td>
<td>-4.083</td>
<td>-0.012</td>
<td>-0.004</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.022*</td>
<td>0.009</td>
<td>-2.467</td>
<td>-0.040</td>
<td>-0.005</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>0.006</td>
<td>0.006</td>
<td>0.881</td>
<td>-0.007</td>
<td>0.018</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Between Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intercept On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Leadership</td>
<td>0.043</td>
<td>0.043</td>
<td>1.018</td>
<td>-0.040</td>
<td>0.127</td>
</tr>
<tr>
<td>Leadership-Admin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Slope On</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Leadership</td>
<td>-0.001</td>
<td>0.011</td>
<td>-0.069</td>
<td>-0.023</td>
<td>0.021</td>
</tr>
<tr>
<td>Leadership-Admin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>-0.020</td>
<td>0.005</td>
<td>-3.755</td>
<td>-0.031</td>
<td>-0.010</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All campuses in the sample exceed the threshold of $7,194 per student in the year 2008 (adjusted for inflation), set by the Baker study (Baker, 2006).

*Research Question 5:*

What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in reading for K-12 public school districts in Texas?
Examination of Percentage Spent on Support Services and Reading Achievement

There are no systematic relationships between the percentage that districts spend on support services (guidance and counseling, social work, and health services) and students’ reading scores over the time frame of this study. The lack of a relationship across theses campuses may be due to the fact that these services are very specialized. Therefore, differences in budgetary spending on these services reflect the district’s practice of meeting the needs of their students with special needs. These needs vary widely across these 81 campuses ($SD = 1.11$).

In summary, expenditure patterns on support services have little to no effect on reading achievement over the time period of this study when variance due to economical disadvantage is controlled. In other words, the percentages spent do not affect the starting point or the growth in reading achievement over time.

Multilevel Growth Model for Reading

In this particular data set there are 75 districts (clusters), providing an average number of students examined per district (cluster) of 23.92, resulting in 1,794 students (observations). Intraclass correlations among the dependent reading variables reported in Table 24 range from 0.077 to 0.109.

Table 24

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraclass Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading 2002-03</td>
<td>0.098</td>
</tr>
<tr>
<td>Reading 2003-04</td>
<td>0.077</td>
</tr>
<tr>
<td>Reading 2004-05</td>
<td>0.109</td>
</tr>
<tr>
<td>Reading 2005-06</td>
<td>0.104</td>
</tr>
</tbody>
</table>
The results indicate that a multilevel model is appropriate for the analysis to account for the variation in the level-two clusters (Byrk & Raudenbush, 1992). According to Byrk and Raudenbush (1992), interclass correlations (ICC) greater than or equal to 0.05 warrant a two-level model.

The resulting multilevel growth model for reading achievement fit the data well, according to the confirmatory fit index (CFI) which equal 0.98. According to Bentler (1989) and Kaplan (2000), for a model to fit the data well, the CFI should range between 0.97 and 1.0, with 1.0 being a perfect fit. In addition, the root mean square error of approximation (RMSEA) is 0.04, which further emphasizes the adequacy of the model. According to Butler and Kaplan, an adequate RMSEA should range from 0.0 to 0.06 which is indicative of a good model fit.

Results for the Multilevel Growth Model for Reading

The parameter estimates, standard errors, \( t \)-statistics and \( p \)-values are reported in Table 25. The results of the within portion of the multilevel growth model displayed in Table 25 indicate that students who are economically disadvantaged began approximately 0.069 points lower than those not classified as economically disadvantaged (intercept = -.069). Furthermore, these same students lose about 0.005 points per year on average (slope = -.005). The covariance between the slope and the intercept is negative, indicating that those students who have a higher rate on reading scores tend to decrease their scores on reading achievement over time. In the between portion of the model, the effects of each of the expenditures on reading achievement is assessed. Students from districts that spend more on support services score lower on reading than their grade peers in districts that spent less on support services.
Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, $t = .732, p > .05$.

Table 25

**Result of Multilevel Model for Reading and Support Services**

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>Est/S.E.</th>
<th>Cl-95%</th>
<th>ClΨ U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.069*</td>
<td>0.007</td>
<td>-9.353</td>
<td>-0.083</td>
<td>-0.054</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.265*</td>
<td>0.047</td>
<td>5.682</td>
<td>0.173</td>
<td>0.356</td>
</tr>
<tr>
<td>Slope On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.005*</td>
<td>0.002</td>
<td>-2.607</td>
<td>-0.009</td>
<td>-0.001</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.018</td>
<td>0.008</td>
<td>-2.218</td>
<td>-0.035</td>
<td>-0.002</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>-0.010</td>
<td>0.007</td>
<td>-1.419</td>
<td>-0.025</td>
<td>0.004</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Between Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Services</td>
<td>0.011</td>
<td>0.036</td>
<td>0.313</td>
<td>0.056</td>
<td>0.082</td>
</tr>
<tr>
<td>Slope On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Services</td>
<td>0.005</td>
<td>0.007</td>
<td>0.732</td>
<td>-0.009</td>
<td>0.019</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>-0.004</td>
<td>0.002</td>
<td>-1.566</td>
<td>-0.008</td>
<td>0.001</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All campuses in the sample exceeded the threshold of $7,194 per student in the year 2008 (adjusted for inflation), set by the Baker study (Baker, 2006).

**Research Question 6:**

What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in math for K-12 public school districts in Texas?

**Examination of Percentage Spent on Support Services and Math Achievement**

In summary, there are no predictable relationships between how districts spend funds in the areas of instruction, instructional administration, and support services and
their students’ math achievement scores over the time period of this study when variance due to SES is controlled. In other words, these expenditure categories have no impact on the students’ starting points or their growth in math achievement over time.

**Multilevel Growth Model for Math Achievement**

In this data set, there are 73 districts (clusters), providing an average number of students examined per district of 23.41 resulting in 1,709 total students (observations). Intraclass correlations among the math variables reported in Table 26 range from 0.06 to 0.10. As stated earlier, ICCs greater than or equal to 0.05 warrant a two-level model. The results of this analysis indicate that a multilevel model is appropriate for these data.

**Table 26**

**Intraclass Correlations for Math by Year**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intraclass Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2002-03</td>
<td>0.103</td>
</tr>
<tr>
<td>Math 2003-04</td>
<td>0.093</td>
</tr>
<tr>
<td>Math 2004-05</td>
<td>0.076</td>
</tr>
<tr>
<td>Math 2005-06</td>
<td>0.062</td>
</tr>
</tbody>
</table>

Similar to the multilevel model for reading, the resulting multilevel growth model for math fit the CFI which equals 0.96 with a range between. In addition, the root mean square error of approximation (RMSEA) is 0.06 with a RMSEA of 0.0 to 0.06 being the measure of good model fit (Bentler, 1989; Kaplan, 2000).

**Results for the Multilevel Growth Model for Math Achievement**

The parameter estimates, standard errors, t-statistics and p-values are reported
in Table 27. In the within portion of the growth model (student level), economically
disadvantaged students start out in grade three with significantly lower math scores
(intercept = -.062) than their higher SES peers and demonstrate significant decreases in
math achievement over the four-year period (slope = -.008). Unlike reading
achievement, the covariance between the slope and intercept is positive (0.006),
meaning that students who score higher on math increase their scores at a faster rate
over the four years.

Table 27

*Result of Multilevel Model for Math and Support Services*

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>S.E.</th>
<th>Est/S.E.</th>
<th>Cl-95%</th>
<th>Clψ U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.062*</td>
<td>0.006</td>
<td>-10.824</td>
<td>-0.074</td>
<td>-0.051</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.176*</td>
<td>0.060</td>
<td>2.947</td>
<td>0.059</td>
<td>0.292</td>
</tr>
<tr>
<td>Slope On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low SES</td>
<td>-0.008*</td>
<td>0.002</td>
<td>-4.083</td>
<td>-0.012</td>
<td>-0.004</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.022*</td>
<td>0.009</td>
<td>-2.467</td>
<td>-0.040</td>
<td>-0.005</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>0.006</td>
<td>0.006</td>
<td>0.881</td>
<td>-0.007</td>
<td>0.018</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Between Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Services</td>
<td>0.069</td>
<td>0.042</td>
<td>1.641</td>
<td>-0.013</td>
<td>0.150</td>
</tr>
<tr>
<td>Slope On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Services</td>
<td>0.002</td>
<td>0.012</td>
<td>0.207</td>
<td>-0.020</td>
<td>0.025</td>
</tr>
<tr>
<td>Slope with Intercept</td>
<td>-0.020</td>
<td>0.005</td>
<td>-3.755</td>
<td>-0.031</td>
<td>-0.010</td>
</tr>
<tr>
<td>(covariance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All campuses in the sample exceeded the threshold of $7,194 per student in the year
2008 (adjusted for inflation), set by the Baker study (Baker, 2006).
Summary of Results

Three types of funding categories and relationship to reading and math achievement are studied over the course of four years. The categories of instruction (Function 11 and 95), instructional leadership/administration (Function 21) and support services (Functions 31, 32 and 33) are considered using the same methodology.

Students from districts that spend more on instruction (Function 11 and 95) scored lower on reading than their grade peers in districts that spend less on instruction. Additionally, these students’ reading scores decrease over time. Students who are economically disadvantaged began approximately 0.069 points lower than those not classified as economically disadvantaged. Furthermore, these same students lost about 0.005 points per year on average. Those students who have a higher rate on reading scores tend to decrease their scores on reading achievement over time. Students from districts that spend more on instruction score lower on reading than their grade peers in districts that spend less on instruction. Additionally, these students’ reading scores decrease over time. Regarding math, unlike reading achievement, the covariance between the slope and intercept is positive, meaning that students who scored higher on math increased their scores at a faster rate over the four years. However, there are no predictable relationships between how districts spend funds in the areas of instruction and math achievement scores over the time period of this study.

Students from districts that spend more on instructional leadership (Function 21) experienced different results in math and reading. The effects of each of the expenditures on reading achievement indicate that students from districts that spend more on instructional leadership score lower on reading than their grade peers in
districts that spend less. Additionally, these students’ reading scores decreased over time, although the rate of the decrease is not statistically significant.

Unlike reading achievement, the covariance between the slope and intercept is positive (0.006), meaning that students who score higher on math increased their scores at a faster rate over the four years. In summary, there are no predictable relationships between how districts spend funds in the areas of instructional administration, and math achievement scores over the time period of this study when SES is controlled. These expenditure categories have no impact.

Results from districts that spend more on support services (Functions 31, 32 and 33) show no systematic relationships between the percentage spent and students’ reading scores over the time frame of this study. The lack of a relationship across these campuses may be due to the fact that these services are very specialized and differences in budgetary spending on these services reflect the district’s practice of meeting the needs of their students with special needs. These needs varied widely across these 81 campuses ($SD = 1.11$). In addition, there are no predictable relationships between how districts spend funds in the areas of support services and math achievement scores over the time period of this study when variance due to SES is controlled. In other words, these expenditure categories have no impact on the students’ starting points or their growth in math achievement over time. Summary and conclusions are drawn from these results in chapter 5.
CHAPTER 5
SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The study was conducted during a time of intense criticism of the monetary efficiency of public schools in the U.S. Public schools. In spite of the trend of increased per-pupil costs, the overall percentage of the educational dollar remained constant at approximately 60% for several decades (Hanushek & Rivkin, 1997). Hanushek, and others, therefore concluded that public schools were not using current resources effectively. The purpose of this study was to expand the extensive body of research that has investigated the perennial question: does money matter in public schools?

The typical model for examining school resource allocation is the educational production function model (Sedl, 2001). Generally, the current study utilizes this model and provides a mathematical description of how inputs (independent variables) contributed to outcomes (dependent variables). Most commonly, these are expressed in a linear equation that relates outputs (usually test scores) to inputs (expenditures). Outputs are traditionally measured with snapshot scores in that one test result is utilized. Even if a large sample is used, the output is based on one result (i.e. SAT score, ACT score, state assessment result...etc). The current study uses latent variable modeling. This technique is emerging as a useful methodology for substantially avoiding many distortions related to limited output measurement (i.e. too much emphasis on one result). In order to deal with these potential distortions, more traditional research has simply limited independent variables. By using latent growth modeling, researchers are able to avoid this limitation. In the current study, latent variable modeling allows for increased sensitivity to the research questions by using multiple indicators without fear
of loss of meaning. Latent variable modeling is useful in the current research because random or systematic measurement error could have potentially presents a problem in that multiple indicators are needed to describe various aspects of the observed phenomenon (Muthén, 1992). Latent variable modeling assists greatly in allowing the sample size to stay large while still being able to draw generalizable conclusions.

Wenglinsky (1997) outlined complications related to limiting sample size in productive models. Three of Wenglinsky’s observations and cautions are considered by the current study.

- Most studies did not take into account the ways in which other factors may have influenced the process of education and the impact that these unique influences may have mediated between spending and achievement
- Most studies did not control for variations in costs between regions of the United States (U.S.)
- Most of the studies used unsophisticated measures of student achievement (Wenglinsky, 1997)

This study takes these shortages into consideration in the research design since student background is considered, common measurement economics are used in both dependent and independent variables and cost variations are minimized in that the same years are compared to a percentage of the total budget. The work of Wenglinsky is carried forward by addressing these typical shortcomings of traditional production-function studies.

Similarly, Pan (2004) explored resource allocation practices in 12 improving schools in Arkansas, Louisiana, New Mexico and Texas. In each case, schools possessed higher than average representation of students from poverty. These improving schools possessed similar characteristics:
• Districts used a needs-based budgeting approach
• Districts leveraged outside funding sources
• Districts used Innovative staffing patterns
• Districts focused on benchmark assessment results
• Districts increased use of technology
• Districts gave priority to professional development
• Districts Increased spending in student instruction

In the Pan study, five years of success was used to determine if the school was an improving school, however, the study did not evaluate the resource allocation practices for all five of those years. The current study advances the knowledge in a way that compares expenditures and performance for each year of the study.

In addition to Pan (2004), a 2001 SEDL study reported the expenditure patterns in school districts considered improving schools. Whereas this study limits production-function econometric concerns by limiting the study to the southwest and by using NCES-CCD, the study does not narrow analysis to relationships between resource allocation and successful schools. The current study advances the knowledge gained in this study by specifically analyzing resource allocation practices of more successful schools compared to less successful schools. It is also important in the current study to determine an amount that is widely accepted as a baseline for adequacy.

Baker, et al. (2006) used a hybrid model of the various types of adequacy study methodologies to develop the amount which they believed constituted an adequate amount, per student, in Texas. By multiplying the average amount of per pupil cost in 2002 and 2004, Baker estimated that the per pupil cost of meeting state performance
standards to be between $6,172 and $6,271 in 2004 dollars in order to achieve a 55% passing rate for all students in Texas. This percentage was based on state requirements from that year and the fact that any academically acceptable campus must have at least 55% passing in all tests. For purposes of the current study, this 2004 amount was converted to 2006 dollars by using the Consumer Price Index (Federal Reserve, 2008). All campuses in the sample exceeded the threshold of $7,194 per student in the year 2008, set by the Baker study. It is important to note that the sample campuses spent 72% of available dollars in Functions 11 and 95. This assessment exceeds the state standard of 65%. This could explain why it was difficult to determine spending patterns, by function, because the sample spent well more than state mandates in Function11. This fact also supports the idea that additional research is needed to attempt to analyze spending practices at the campus and/or classroom level.

Descriptive statistics of the aforementioned variables are conducted in SPSS™.

To examine the impact of expenditure patterns on student achievement over time, Mplus 4.2 is used to determine how well a two-level growth model fit the four-year continuous outcomes in math and reading. This chapter summarizes the findings of the study organized by the following research questions:

Results by Research Question

Research Question 1:

What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in reading for K-12 public school districts in Texas?

Spearman rho correlation coefficients are computed among the variables and

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2 SPSS Inc., http://www.SPSS.com
indicate that statistically significant correlations range from $r = -0.139$, $p < 0.01$ between reading and percentage spent on instruction. The effect size indices indicate 0.02 overlapping variance between reading and expenditures ($r^2 = 0.02$).

Students from districts that spend more on instruction score lower on reading than their grade peers in districts that spend less on instruction. Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, $t = -1.946$, $p > 0.05$. Data indicates that students who are economically disadvantaged began approximately 0.069 points lower than those not classified as economically disadvantaged (intercept = -0.069). Furthermore, these same students lose about 0.005 points per year on average (slope = -0.005). The covariance between the slope and the intercept is negative, indicating that those students who have a higher rate on reading scores tend to decrease their scores on reading achievement over time.

*Figure 4.* Reading performance of low SES versus non-low SES.

Also significant is the fact that in the between portion of the model, the effects of each of the expenditures on reading achievement is assessed and students from districts that
spend more on instruction scored lower on reading than their grade peers in districts that spend less on instruction. Since all campuses meet the adequacy standard set forth by Baker, there is an assumption there are an adequate amount of dollars made available; however, these inputs in Functions 11 and 95 have little bearing on student’s success. Nevertheless, the data indicates that low SES students start lower and sample schools did a fair job of keeping the performance gap tight between High and low SES.

Research Question 2:

What is the relationship between expenditures in instruction (functions 11 and 95) and student achievement in math for K-12 public school districts in Texas?

Spearman rho correlation coefficients are computed among the variables and indicated that statistically significant correlations range from $r = -.051$, $p < .01$ between math and percentage spent on instruction. The effect size indices indicate 0.00 overlapping variance between math and expenditures ($r^2 = .00$ for math).

There are no predictable relationships between how districts spend funds in the areas of instruction, and their students’ math achievement scores over the time period of this study when variance due to SES is controlled. In other words, these expenditure categories have no impact on the students’ starting points or their growth in math achievement over time. However, in the within portion of the growth model (student level), economically disadvantaged students start out in grade 3 with significantly lower math scores (intercept = -.062) than their higher SES peers and demonstrated significant decreases in math achievement over the four-year period (slope = -.008). Unlike reading achievement, the covariance between the slope and intercept is positive (0.006), meaning that students who initially score higher on math increase their scores
at a faster rate over the four years.

\[ \text{Figure 5. Math performance of low SES versus non-low SES.} \]

Since all campuses meet the adequacy standard set forth by Baker, there is an assumption there is an adequate amount of dollars made available; however, these inputs in Functions 11 and 95 have little or no bearing on student’s success in math. This data suggests that students from low SES background start out lower in math and only got further behind non-low SES throughout the four years of analysis. Since some campuses are considered *successful* (outlined in chapter 3) with low SES students, it is assumed that some interventions were being successful; however, those interventions can not be traced by an analysis of expenditure patterns. This result is discovered through the use of Mplus, latent growth analysis. As stated previously, the advantage of Mplus is the discovery of hidden variables. In this case, Mplus is able to show the pattern of low SES students versus non-low-SES students over time. This discovery of latent variable is one of the major findings in this study. This finding is outlined in greater detail in the recommendation for future research section of chapter 5.
Research Question 3:

What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in reading for K-12 public school districts in Texas?

Spearman rho correlation coefficients are computed among the variables and indicate that statistically significant correlations ranged from \( r = -0.106, p < .01 \) between reading and percentage spent on instructional leadership/administration. The effect size indices indicate 0.02 overlapping variance between reading and expenditures (\( r^2 = 0.02 \) for reading).

The results of the within portion of the multilevel growth model displayed in Table 15 indicate that students who are economically disadvantaged began approximately 0.069 points lower than those not classified as economically disadvantaged (intercept = -.069). Furthermore, these same students lose about .005 points per year on average (slope = -.005). The covariance between the slope and the intercept is negative, indicating that those students who have a higher rate on reading scores tended to decrease their scores on reading achievement over time. In the between portion of the model, the effects of each of the expenditures on reading achievement is assessed. Students from districts that spend more on instructional leadership/administration score lower on reading than their grade peers in districts that spend less on instructional leadership/administration. Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, \( t = .137, p > .05 \).

Since all campuses meet the adequacy standard set forth by Baker, there is an assumption there are an adequate amount of dollars made available; however, these inputs in Function21 have little bearing on student’s success.
Research Question 4:

What is the relationship between expenditures on instructional leadership/administration (Function21) and student achievement in math for K-12 public school districts in Texas?

Spearman rho correlation coefficients are computed among the variables and indicated that statistically significant correlations range from $r = -.067$, $p < .01$ between math and percentage spent on instructional leadership/administration. The effect size indices indicate 0.00 overlapping variance between math and expenditures ($r^2 = .00$ for math).

There were no predictable relationships between how district’s spent funds in the areas of instructional leadership administration and students' math achievement scores over the time period of this study when SES is controlled. These expenditure categories have no impact on the students’ starting points or their growth in math achievement over time.

In the within portion of the growth model (student level), economically disadvantaged students start out in grade three with significantly lower math scores (intercept = -.062) than their higher SES peers and demonstrate significant decreases in math achievement over the four-year period (slope = -.008). Unlike reading achievement, the covariance between the slope and intercept is positive (.006), meaning that students who initially score higher on math increased their scores at a faster rate over the four years. Since all campuses meet the adequacy standard set forth by Baker, there is an assumption there are an adequate amount of dollars made available; however, these inputs in Function21 have little bearing on student’s success.

These data suggests that students from low SES background start out lower in math and only decline behind non-low SES throughout the four years of analysis. Since
some campuses are successful with low SES students, it is assumed that some interventions are being successful; however, those interventions can not be traced by an analysis of expenditure patterns. This result is discovered through the use of Mplus, latent growth analysis. As stated previously, the advantage of Mplus is the discovery of hidden variables. In this case, Mplus was able to show the pattern of low SES students versus non-low-SES students over time. This discovery of latent variable is one of the major findings in this study. This finding is outlined in greater detail in the recommendation for future research section of chapter 5.

Research Question 5:

What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in reading for K-12 public school districts in Texas?

Spearman rho correlation coefficients are computed among the variables and indicated that statistically significant correlations range from $r = -.002, p < .01$ between reading and percentage spent on support services. The effect size indices indicate 0.02 overlapping variance between reading and expenditures in support services ($r^2 = .02$ for reading).

There are no systematic relationships between the percentage that districts spend on support services (guidance and counseling, social work, and health services) and students’ reading scores over the time frame of this study. The lack of a relationship across theses campuses may be due to the fact that these services are very specialized. Therefore, differences in budgetary spending on these services reflect the district’s practice of meeting the unique needs of students with special concerns. These expenditures vary widely across these 81 campuses ($SD = 1.11$).
In summary, expenditure patterns on support services have little to no effect on reading achievement over the time period of this study when variance due to economical disadvantage is controlled. In other words, the percentages spent on these three functional areas do not affect the starting point or the growth in reading achievement over time.

The results of the within portion of the multilevel growth model displayed in Table 15 indicate that students who are economically disadvantaged begin approximately .069 points lower than those not classified as economically disadvantaged (intercept = -.069). Furthermore, these same students lose about .005 points per year on average (slope = -.005). The covariance between the slope and the intercept was negative, indicating that those students who have a higher rate on reading scores tended to decrease their scores on reading achievement over time. In the between portion of the model, the effects of each of the expenditures on reading achievement was assessed. Students from districts that spend more on support services scored lower on reading than their grade peers in districts that spend less on support services. Additionally, these students’ reading scores decrease over time, although the rate of the decrease is not statistically significant, \( t = .732, p > .05 \).

Research Question 6:

What is the relationship between expenditures on support services (functions 31, 32, 33) and student achievement in math for K-12 public school districts in Texas?

Spearman \( \rho \) correlation coefficients are computed among the variables and indicated that statistically significant correlations ranged from \( r = .004, p < .01 \) between math and percentage spent on support services. The effect size indices indicate .00
overlapping variance between math and expenditures \((r^2 = .00\) for math).

In summary, there are no predictable relationships between how districts spend funds in the areas of support services and their students’ math achievement scores over the time period of this study when variance due to SES is controlled. These expenditure categories had no impact on the students’ starting points or their growth in math achievement over time.

In within the portion of the growth model (student level), economically disadvantaged students start in grade three with significantly lower math scores (intercept = -.062) than their higher SES peers and demonstrate significant decreases in math achievement over the four-year period (slope = -.008). Unlike reading achievement, the covariance between the slope and intercept is positive (.006), meaning that students who initially score higher on math increase their scores at a faster rate over the four years.

This data suggests that students from low SES backgrounds start out lower in math and only got further behind non-low SES throughout the four years of analysis. Since some campuses are successful with low SES students, it is assumed that some interventions are being successful; however, those interventions can not be traced by an analysis of expenditure patterns. This result is discovered through the use of Mplus, latent growth analysis. As stated previously, the advantage of Mplus is the discovery of hidden variables. In this case, Mplus is able to show the pattern of low SES students versus non-low-SES students over time. This discovery of latent variable is one of the major findings in this study. This finding is outlined in greater detail in the recommendation for future research section of chapter 5.
Conclusions

Correlations between reading scores and expenditures are slightly stronger than the correlations between math scores and expenditures. The correlations between the achievement scores and the remaining expenditures (percentage spent on instructional administration and percentage spent on support services) are also statistically significant; however, their magnitudes have no practical significance. An explanation for the finding of statistical significance among most of them is due in part to the large sample size (Cohen 1988; Thompson, 1996)

The Pearson correlations indicate that correlations ranged between $r_{pb} = -.321$, $p < .001$ between SES and reading achievement 2005-2006 and $r_{pb} = -.236$, $p < .001$ between SES and math achievement 2003-04 and 2005-06. The Pearson results of each of these relationships are negative, indicating that students from districts with high economic disadvantage tend to score significantly lower on both reading and math achievement tests. Again, correlations between reading and SES are stronger than the correlations between math and SES. The practical significance or effect size between reading and SES is $r^2 = .07$ to $r^2 = .10$. The effect size between math and SES was $r^2 = .06$ to $r^2 = .07$. Taken together, SES accounts for 9% of the variation in reading performance, whereas it accounts for only 6% of the variation in math performance. It is important to remember is that an existing correlation does not equal causation. These statistical significant findings may have been the result of a large sample (Cohen 1988; Thompson, 1996). Since all campuses meet the adequacy standard set forth by Baker, there is an assumption there were an adequate amount of dollars made available; however, these inputs in Functions 11, 95, 21, 31, 32 and 33 have little bearing on
student’s success. This result is counter to numerous studies that draw positive correlation between increased dollars in these categories and student performance. It is important to note that conclusion can either mean that most commonly used measurements may have significant flaws in methodology or that, as Monk asserted, that input-analysis should be conducted at the classroom level. In addition to this conclusion, there are two other conclusions of practical application to educational leaders.

Even though the original intent of the study is to analyze relationship(s), if any, between specific spending categories and student performance in math and reading, a latent variable emerged. This latent variable is one of the major findings and is described as follows. If campuses in the study are all meeting adequacy standards and some campuses are high performing even though they contained a majority of students in low SES and no (or very little) discernable pattern could be traced through expenditure analysis, then some (non-financial) positive effect is occurring at the instructional leadership level and/or there is a difference in the way teachers determine how dollars should be spent (at the classroom level).

As the State of Texas continues to grow in number of students from low SES background, further analysis is critical. Future research should focus on classroom effects and state leadership should study leadership and invest heavily in leadership development. State leaders should also be leery of an attitude that federal dollars (Title) are the only additional dollars needed for addressing the unique needs of students from low SES. The state should consider using the current recapture formulas to invest more heavily in campuses with high number of students from low SES to ensure that the
human capital is available for Texas in the future. This is especially true for student outcomes in mathematics.

Findings strongly suggest that previous production-function studies (using only SPSS) could have compromised results by only measuring one snapshot of data. In many cases, data of this nature was compared to a snapshot from the same campus, but different students. Mplus proves to be very useful in analyzing multiple years of inputs and outputs and comparing them in a meaningful way. Mplus also ensures that only students present for all four years are included. It is extremely important that a substantial amount of additional research be conducted using latent technology to ensure that the historical does money matter debate is balanced with clearer data analysis.

Thirdly, the results of the current study indicate that input-based policies are not the solution for all schools. Districts have different needs and should have autonomy to apply resources in ways that meet the unique needs of their children. In other words, an adequate amount of resources are needed and then autonomy is needed to make the best decision for their children.

Recommendations for Leaders and Policy-makers

As the State of Texas continues to grow in number of students from low SES background, further analysis is critical. Future research should focus on classroom effects and state leadership should study leadership and invest heavily in leadership development. State leaders should also be leery of an attitude that federal dollars (Title) are the only additional dollars needed for addressing the unique needs of students from
low SES. The state should consider using the current recapture formulas to invest more heavily in campuses with high number of students from low SES to ensure that the human capital is available for Texas in the future. State leaders and education policymakers should also ensure that adequate professional development is provided to ensure that existing dollars are spend wisely. As Byrd (2009) asserts, “Understanding and using data about school and student performance are fundamental to improving schools. Effective use of data can change how social leaders respond to accountability demands” (p. 5). Campus leaders must be trained extensively in data analysis in order to ensure that existing, or future dollars are targeted to student need. Many principals that are adequate at collecting, analyzing and using data themselves have even more difficulty in leading their teachers through the data-driven decision making processes that are necessary to affect behavioral change in schools (Reeves & Burt, 2006). The current study advances these findings.

In addition, accountability systems are designed to establish standards, assessment protocol and consequences, while allowing the local school district the flexibility to allocate resources to meet student needs. As state leaders attempt to establish future accountability procedures and funding formulas, they should consider a latent growth model. Schools should be held accountable for student growth, not snapshots and comparisons of oftentimes different student groups. A more fair and effective system should include the comparisons of the same students to themselves over time. With proper data gathering and analysis tools (growth modeling), this could be accomplished.

Finally, there has been a conventional wisdom that if schools teach students to
read, then they will be able to learn the math eventually. Therefore, the state has invested heavily in early reading initiatives. This study suggests that this conventional wisdom may not hold true. In both reading and math, students from low SES backgrounds started out lower their non-low SES counterparts, however, the performance gap got worse for the same students in math over the course of the time period in the analysis. This reality only increases the difficulty for the teacher at the classroom level in addressing the unique needs of all students in a classroom with a widening gap in student instruction. This data suggests that state leaders must invest heavily in early math initiatives and specifically target low SES students.

Recommendations for Further Research

Monk (1992) doubted that problems associated with production function approach could be addressed. Instead, he proposed to shift the unit of analysis for school resource studies to the classroom level. The current study extended the rationale for Monk’s recommendations for a research program in which teachers were interviewed to provide retrospective information on the problems they faced and the degree to which resources assisted or acted as a constraint. An appropriate extension of the current study would be to study the classroom unit.

As Pan (2004) explored resource allocation practices in 12 improving schools in Arkansas, Louisiana, New Mexico and Texas. Future research could be dedicated to study of any or all of those variables (listed below) as they relate to school resource allocation:

- Impact of district budgeting approach
- Impact of leveraging outside funding sources
• Impact of innovative staffing patterns
• Impact of use and focus on benchmark assessment results
• Impact of increased use of technology
• Impact of increased priority to professional development

Miles and Darling-Hammond (1997) argued that too little research addressed how schools might organize teaching resources more effectively at the school level. Their research attempted to describe case studies of five high-performing public schools that organized resources in innovative ways. Although the schools were very different in student makeup, they shared five principles in resource allocation practices: (1) reduction of specialized programs and more effort to reduce student-to-teacher ratio; (2) more flexible student grouping; (3) structures to support relationships; (4) longer blocks of instructional time; and (5) more time for teachers to plan lessons together. They reported that high performing urban high schools departed from traditional approaches in the above ways. The study primarily addressed the reallocation of existing funds and not measuring changes in the total amount of dollars invested. The current study reinforced the need to conduct future research that attempts to explore how the dollars that are available are utilized, once an adequate threshold is established.

Nyhan (1999) used a statistical analysis to test the relationship of class size and per pupil expenditures. His study was conducted in three south Florida counties. He found that there was modest support for the targeted expenditures for classes above 20 students. In addition to these findings, his research supported previous findings that poverty is a primary determinant of student achievement. Whereas class size was not a major component of the current study, it is important to note that class size is difficult to
study as a part of another study. Class size should specifically be studied with future research, especially when there is interest in studying successful high poverty schools.

In response to the six research questions, little correlation could be found between spending patterns in the six functions and student performance. However, some campuses with a higher percentage of low SES outperformed other low SES campuses and some non low SES campuses. This indicates that money does matter in the sense that once adequacy standards are met, successful campuses are utilizing resources better at the classroom level. This fact strongly asserts that mid-managers (primarily principals) must have the data analysis skills to ensure that limited resources are allocated appropriately.

It is, therefore, important to analyze how limited dollars are spent, once an adequacy threshold is achieved. Adequacy standards are now generally accepted throughout the country. Further research must be focused on how limited dollars are spent and the training that principals need in order to make these decisions.
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