THE IMPACT OF SPENDING CUTS ON MISSOURI STUDENT ACHIEVEMENT

A DISSERTATION IN
Education

Presented to the Faculty of the University of Missouri-Kansas City in partial fulfillment of the requirements for the degree

DOCTOR OF EDUCATION

by

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Kansas City, Missouri
2013
ABSTRACT

Since the Coleman Report in 1966, researchers have been analyzing educational resource inputs with respect to district, school, and student level outputs. There has been an increase in federal and state control of local school districts, as demonstrated in the adoption of the Common Core Standards and mandatory national and state assessments. In conjunction with these changes, an economic recession has resulted in reduced funding for education that has required school districts to be more efficient in allocation of resources. Local school officials are pressed to allocate resources such that a maximum output is achieved in student achievement and district achievement.

The purpose of this study was to quantify the impact that expenditure reductions had on student achievement in Missouri school districts. By looking longitudinally at operating expenditures, this quantitative study examined a correlation to student achievement as measured by the Missouri Assessment Program (MAP) assessments, graduation rates, and attendance rates.
This study found a slightly negative relationship between per-pupil expenditures and attendance rates across 267 Missouri school districts. Per-pupil expenditures did not have predictive significance when compared to graduation rate or MAP scores. Through the findings of this study, district decision makers will have insight into more efficient allocation of scarce educational resources. This study will also provide direction for further research on the impact of education inputs that effect achievement.
The faculty listed below, appointed by the Dean of the School of Education, have examined a dissertation titled “The Impact of Spending Cuts on Missouri Student Achievement,” presented by Andrew Ray Kohl, candidate for the Doctor of Education degree, and certify that in their opinion it is worthy of acceptance.

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DEFINITIONS OF KEY TERMS

**Attendance rate.** The ratio of attendance hours to the number of attendance and absence hours for a school district K-12 submitted by districts to DESE. The Department (DESE) uses the Missouri School Improvement Program (MSIP) and No Child Left Behind (NCLB) attendance data reported by school districts and Local Education Agencies (LEA) via the Missouri School Information System (MOSIS) and aggregated on Screen 14 of the Core Data Collection System to calculate attendance rates. The hours of absence method of calculating attendance was used. Calculation: (MSIP/NCLB Total Hours of Attendance/(MSIP/NCLB Total Hours of Attendance + MSIP/NCLB Total Hours of Absence))*100

**Adequate funding.** The state funding necessary for school districts to ensure students have a meaningful opportunity to meet state academic standards. Funding protected at the state level by state right to education clauses in state constitutions. DESE uses the State Adequacy Target (SAT) as their appropriate funding amount.

**Assessed valuation.** The valuation of taxable property within a school district as reported to DESE for Core Data.

**Efficient allocation of resources.** The distribution of school resources with accountability for performance. Resources support programs and practices that have a positive measurable impact on student and district achievement. A distribution method that recognizes that students and their educational challenges vary across a school district and allocates resources accordingly (vertical equity). A system that roots out waste and eliminates costly practices maintained only for their historical merits. Reallocating

**Funding equity.** The equitable distribution of state educational resources protected under state’s equal protection clauses in state constitutions. In the Missouri distribution formula this is accomplished through weighted average daily attendance that distributes more funds to those districts with higher than average number of students that qualify for Free and Reduced Lunch (F&RL), students on Individual Education Plans (IEP), and students of Limited English Proficiency (LEP).

**Graduation rate.** The ratio of number of graduates to their prior four-year cohort including dropouts reported by districts to DESE. The Department (DESE) uses graduate and dropout data reported by school districts/LEAs via MOSIS and aggregated on Screen 13 of the Core Data Collection System to calculate persistence to graduation rates. Calculation: \( \frac{\text{Graduates}}{\text{Graduates} + \text{Cohort Dropouts}} \times 100 \)

**Instructional expenditures.** The total K-12 Instructional Expenditures reported on the Annual Secretary to the Board Report under the 1999 function code and submitted to DESE annually by school districts.

**MAP scores.** The results from the annual Missouri Assessment Program exams administered to public school in the spring. Exams include third, fourth, fifth, sixth, seventh and eighth grade for mathematics and communication arts, fifth and eighth grade science, and End of Course (EOC) exams at the completion of English I, English II, Algebra I, Algebra II, Geometry, American History and Government.
**Per-pupil expenditures.** The current district operating expenditures per average daily attendance as calculated by the Annual Secretary to the Board Report (ASBR) and report on MoDESE (Missouri Department of Elementary and Secondary Education, henceforth referred to as DESE) Core Data. Expenditures do not include capital project outlay and is corrected for offsetting revenues in student activities and food service as well as tuition and fee revenues from other school districts.

**State Adequacy Target.** The average PPE of the middle 90% of Missouri performance districts when ranked according to PPE. DESE recalculates the SAT every two years using the most current available data. The SAT is not decreased due to recalculation and any increase is phased in equally over two years. The SAT may be adjusted to accommodate available appropriations.

**Years 2010 and 2011.** Data are a reflection of school district activity during those fiscal years. A school district fiscal year in Missouri is from July 1st to June 30th. Year 2010 includes data from July 1st, 2009 to June 30th, 2010 and year 2011 includes data from July 1st, 2010 to June 30th, 2011. These years of data were selected for the study due to the potential impact of the national recession on Missouri school district revenues during that time period.
ACKNOWLEDGEMENTS

I dedicate this dissertation to my wife Susan, daughter Maggie, sons Ryan and Isaac, my ever supportive sister-in-laws Nan and Karen as well as the Kohl and Dixon families. Completion of this work would never have been possible without their endless time, love, and support. I only hope that this work is worthy of the sacrifices that they have made. I appreciate all that they have given to make this accomplishment possible.

I would also like to thank all my professors at UMKC and my Northland cohort colleagues that have guided me through three graduate degrees. Their willingness to share their experiences and knowledge has helped to direct my daily work as a school administrator. These individuals are a testament to the strength of a cohort learning experience and the depth of knowledge that can be gained from using the Socratic model. Specifically, I would like to thank my dissertation committee for supporting me and providing constructive feedback during this process. Without the support and guidance of my committee members Dr. Gus Jacob, Dr. S. Marie McCarther, Dr. Dianne Smith, and my chair, Dr. Jennifer Friend, this study could not have been completed.

Finally, I would like to thank my professional colleagues and friends, Dr. Renee’ Freers, Dr. Mike Jeffers, Dr. Scott Patrick, Dr. Deborah Orr, Dr. Lamar Hicks, and Mr. Bryan Weyrauch for their support of my work as a professional educator. They have challenged me, taken chances on my ability to accomplish great things, and supported me through my growth as an educator.
CHAPTER 1
INTRODUCTION TO THE STUDY

Public education is entering a second phase in the new era of accountability as the unrealistic benchmarks of the No Child Left Behind (NCLB) Act (2002) give way to national standards, higher teacher accountability for student performance, and national assessments. Forty-four states, Puerto Rico, the Bureau of Indian Education, and the District of Columbia have been granted or applied for waivers from NCLB in return for Common Core standards, assessments, and revised evaluation practices (U.S. Department of Education, 2012). Meanwhile, the challenge of educating all students with less federal, state, and local funding has forced school district leaders to maximize the efficient use of these resources and the urgency of this role has only been intensified by the recent recession. The process of identifying the most effective use of district resources is not a new dilemma, yet solutions and effective analysis of programs with measureable influence on student achievement seems to evade most school districts across the nation. Based on numerous research studies, merely increasing the resources for schools is not likely to lead to an increase in student achievement (Hanushek, 2003).

Since the 1966 Coleman Report, researchers have sought to establish a valid connection between schooling inputs and student achievement in an attempt to challenge that report’s finding of a much greater connection of student achievement to family inputs and students’ school peers. Over four decades of research has not established a clear connection between school resources and student achievement. As expenditures on education have risen at a rate of
over 3% per year (1890-1990), student achievement data have shown minimal gains at best (Hanushek, 2003). In light of the impact of the recent recession on school district resources, a purpose of this study was to consider the possible correlation between school district per-pupil expenditures and student achievement over two school years when many school districts were forced to make cuts in their expenditures. The study may provide possible insight into the effectiveness of schools with respect to trimming expenditures while maintaining high achievement standards. Included in Chapter One is a background of the study, problem statement, the purpose, theoretical framework, research questions along with hypotheses, the nature, significance, and limitations of the study.

**Background**

School administrators face many issues in improving today’s public schools. The No Child Left Behind Act (NCLB) of 2002 has brought to the forefront a need for school administrators to work with national and state leaders as well as their local communities to address deficiencies in student learning. NCLB is a reauthorization of the Elementary and Secondary Educational Act of 1965 (ESEA) that was crafted by then United States Commissioner of Education, Frank Keppel. Through the introduction of Title I funds, ESEA provided educational resources to public and parochial schools to serve the needs of students from low income families which solidified the federal government’s involvement in public education (Hanna, 2005). In its infancy, Hanna also points out that ESEA was a funding tool to ensure that schools abided by desegregation laws (2005). Since 1965, ESEA has seen several reauthorizations and most recently a push towards goals and standards initiated under the Clinton administration with “Goals 2000.” The most current reauthorization of ESEA, often referred to as NCLB has placed annual targets on competencies in math and communication arts that lead to
100% proficiency for all students by the year 2014. NCLB is a federal mandate not unlike Public Law 94-142, the Education for All Handicapped Children Act of 1975, more commonly known as IDEA, in that local school districts have accountability measures placed upon them with little to no additional funding for implementation (Grubb, 2009; IDEA Funding Coalition, 2006).

Due to the inability of recent congressional sessions to reauthorize NCLB, the Obama administration has encouraged states to apply for a waiver (ESEA Flexibility) from NCLB. These waivers are in the form of more rigorous individual state plans developed to improve education outcomes for all students, close achievement gaps, increase equity, and improve the quality of instruction. The three common principles to improve education included in state plans are: (a) college and career-ready expectations for all students, (b) state-developed differentiated recognition, accountability and support, and (c) supporting effective instruction and leadership (U.S. Department of Education, 2012). Missouri applied for and has been granted ESEA Flexibility, yet the ultimate accountability rests with local school boards and administrators to promote achievement for all students regardless of gender, race, socioeconomic status, disability, or English language proficiency. These Boards of Education and administrative leaders spend a great deal of time working with stakeholders to analyze data and assess the needs of their individual learning communities.

Current research has become more helpful in this effort to educate all students as studies identify school inputs such as instructional expenditures, school improvement programs, and average teacher salary that have a measurable impact on student achievement (Archibald, 2006; Hedges, Laine, & Greenwald, 1994; Knoeppel, Verstegen, & Rinehart, 2007; Odden et al., 2008; Ram, 2004). Educational resources are being analyzed at the federal, state, and local levels for
their impact on student achievement, typically measured through standardized assessment scores as well as district indicators of success such as graduation rate and attendance rate.

Revenue for school districts across the nation comes almost evenly from state and local levels while the federal contribution is approximately 7-8% of all revenues (Grubb, 2009; Hanushek, 2003). A portion of state funding (categorical funds), similar to federal funding, are often tied to specific groups, programs, operations, functions, or activities. In 2009, all states but Tennessee used some categorical funding to distribute a portion of their state funds (Hightower, Mitani, & Swanson, 2010). The only funds remaining at the distribution discretion of schools and districts are the unrestricted portion of their foundation formulae and local tax funds not allocated to pay debt service. The restrictions on spending of federal and state funds can cause inefficiency in the allocation of educational resources for school districts and stifle innovation. In light of little funding at the discretion of school districts and schools, Grubb (2010) summarizes that, “under the current conditions, the incentives and conditions necessary for more effective use of resources is simply missing” (p. 87).

Though federal funds and categorical state funds cause issues at the local level in distribution of resources, formula funds at the state level come with their own set of issues. Federal funding such as Early Childhood Special Education and vocational funds require a state matching portion and are allocated to a specific purpose. However, unlike federal funding, the basic distribution mechanisms (funding formulae) for state funding are not standardized across the nation and are typically used to equalize local wealth disparities between school districts (Grubb, 2009; Hanushek, 2003). Adequacy of funding, particularly across school districts with varied needs within a state, has come under increased scrutiny with state funding formula litigation across most states in the nation. Rose v. Council for Better Education (1989)
demonstrated the potential legal implications of such scrutiny, as several state courts have moved to define the characteristics of adequate education in response to concerns raised by state educational entities regarding adequacy of state funding (Odden et al., 2008; Rubenstein, 2002).

In 2005 alone, there were eight states with court decisions on school spending levels and the constitutionality of school district spending. Plaintiffs have filed 125 such court cases since the late 1960s (Guthrie & Springer, 2007). Missouri has been through several litigations on school funding dating back to the Kansas City Missouri School District desegregation case of Missouri v. Jenkins (1990). That desegregation case made history as one of the prime examples of how an increase in per-pupil expenditures does not necessarily equate to an increase in student achievement (Hanushek & Lindseth, 2009). Missouri has transitioned through two funding formulas [Senate Bill 380 (1993) and Senate Bill 287 (2005)] since the state school finance system was found unconstitutional on the ground of equity in 1993. The national recession of 2009 forced several school districts in the state of Missouri to make significant budget cuts impacting programs and staffing. Unfortunately, the recession hit as Missouri was phasing in their new foundation formula (S.B. 287), which called for additional revenues each year to maintain full funding. With no new revenues due to recession driven reductions in sales tax and income tax, the state was forced to reduce formula funding from 100% in 2008-09 to 94% in 2011-12 and 92% by September of 2012 (MoDESE, 2012).

**Problem Statement**

State funding of K-12 education across the United States increased from 16% in 1920 to around 50% by 2006, while the local tax contribution shifted from 80% to roughly 45% in the same time period (Hightower et al., 2010). This shift in resource allocation has created a tremendous responsibility for states over the past half-century to ensure equitable distribution of
those resources. Due to the 1973 decision in San Antonio Independent School District v. Rodriguez, a shift occurred in litigation from the United States Constitution with respect to the “equal protection clause” to enforcement of state constitution equal protection education clauses. This shift has similarly forced states to examine how those resources are allocated (Podgursky, Smith, & Springer, 2008). Historically, state funding formulae and finance policy have served the function of equalization with respect to local wealth. School districts with large amounts of local wealth (assessed by property value) have the potential to generate much more local revenue than school districts with lower property values. There are 46 states that use weighting or adjustments in their finance formulas to provide additional resources to certain districts, schools, or students (Hightower et al., 2010). Without these adjustments, there is potential for educational funding inequity for low social economic status (SES) groups, students on individual education plans (IEP), and English language learners (ELL), as well as inequities due to local property wealth. One such example of this inequality in funding was demonstrated by Reschovsky and Imazeki’s (2003) finding that the distribution and adequacy of state funding across Texas district levels was considerably varied.

Disparities in distribution of funding among school districts could have a significant impact on student learning, as Knoeppel et al. (2007) found significant relationships to student achievement between not only local wealth and total number of days attended during the year, but also teacher quality as measured by average salary and per-pupil expenditures across 128 school districts in the Commonwealth of Virginia. In contrast, Ram (2004) estimated that increasing per-pupil expenditures by $1,000 in a typical state would only result in a gain of just over four points on the math portion of the SAT. Additionally, no significant correlation was detected between per-pupil expenditures and the verbal portion of the SAT. While a significant
positive correlation was found between per-pupil expenditures and the combined mathematics and verbal portions of the SAT, the positive estimate was quantitatively modest, thus implying that at the state level, per-pupil expenditures may not have a profound impact on student achievement scores. In light of these and other studies in the last decade, the question is raised as to whether an increase in per-pupil expenditures for school districts, rather than at the state level, will have a measurable impact on student achievement. Thus, the focus of this study was to examine the relationship between per-pupil expenditures and student achievement outcomes specifically at the school district level.

**Purpose**

The purpose of this quantitative, correlational research study was to determine whether a relationship exists, and to what extent, between per-pupil expenditures and student achievement outcomes at the school district level. In this study, resources and achievement were examined over two school years at the onset of the 2009 recession to analyze if school districts could cut significant funds from their operating budgets, yet see no negative impact on student or district achievement. Should the impact be negligible, this would give credence to the argument by some researchers and policy-makers that school districts are not efficient in their allocation of resources to impact student achievement. School districts would be forced to live within their economically stressed budgets and delineate what inputs have the greatest impact on achievement, thereby becoming more efficient (Hanushek, 2010).

**Theoretical Framework**

A theoretical framework gives focus to a study by identifying the concepts and existing theories related to the research in question. It allows the reader to evaluate the theoretical assumptions of the study, forces the researcher to examine existing knowledge relating to the
study, and helps the researcher determine the degree to which results can be generalized (USC, 2012). This study examined the potential policy implications at the local, state, and national levels as it relates to educational resources. When investigating a connection between educational resources and student or district achievement, it is important to consider theories surrounding public school funding sources, equity and adequacy of funding, and types of analytical approaches to inputs and outputs.

**Public school funding.** The majority of public school funding is derived from federal, state and local levels with state and local funds making up around 90% of all funding (Hanushek & Lindseth, 2009). The distribution of revenue at the state and federal levels can often produce inefficiencies at the classroom level. Districts and schools use of federal and state funds is too restrictive and the funds do not adequately cover the cost to implement the accompanying mandates. Researchers have repeatedly identified these issues in numerous studies over the last decade (Grubb, 2009; Hanushek & Lindseth, 2009; Rebell & Wolff, 2008).

Federal funds for the large part must be directed to specific groups of students or programs and are typically audited annually to ensure compliance. Few federal funds (Impact Aid), state non-categorical funds (foundation formulae), and local funds can be used at the discretion of the local school board. These constraints do not allow districts, schools, and teachers to focus resources on effective initiatives or innovation that impact student achievement (Grubb, 2009). Learning institutions are viewed as models of innovation and replication of effective knowledge and skill acquisition, however restrictions on how funds can be spent coupled with limited discretionary funds effectively stifles that function for many school districts.
Governmental entities and courts have a long history of influencing education through legislation, directives, and legal opinions. School districts are forced to respond to these forces through additional programs, additional staff, testing, and procedures typically with limited additional funding and often no additional funding at all from the state and federal level. Public Law 94-142, NCLB, and MAP testing are just of few examples of unfunded or underfunded mandates at the state and federal level. With federal approval of Missouri’s ESEA waiver, school districts are again footing the bill to implement Common Core Standards and preparing for the accompanying testing initiative. This dilemma has helped to fuel litigation at the state level with respect to funding adequacy.

**Funding equity and adequacy.** Prior to the 1950s, the courts and federal government had a very limited role in education as most of the important decisions were dealt with at the state and local school board level (Hanushek & Lindseth, 2009). With the *Brown v. Board of Education of Topeka* decision of 1954, the courts entered the arena to ensure equity in education. The courts continue to act in the interest of equity, but recent attention to the costs of education and distribution of state funds have moved the court litigation into the area of adequacy. State funding equity and adequacy has been litigation in 45 of the 50 states since 1973 and when the litigation turned to an adequacy issue after 1989, the plaintiffs prevailed in 20 of 29 cases (Rebell, 2011). Theories of equity and adequacy have direct bearing on this study as they are an integral part of how funds are distributed to school districts and in turn how districts allocate those funds.

**Funding equity.** Equity theory cases are brought before the courts on the premise that state funding distribution violates the states equal protection guarantee by unequal distribution of funds (Tang, 2011). Equity in education began with access to education and has its roots in
Brown v. Board of Education of Topeka, but moved in 1973 to challenges of state funding systems in Rodriguez v. San Antonio Independent School District as civil rights lawyers quickly ascertained that state formulae were the source of many inequities (Rebell, 2011). This case was a prime example of how state formulae based on local tax effort can create inequity due to lower property values in poor neighborhoods. Under these types of distribution methods, poorer districts would have to tax themselves at a much higher per diem than wealthier districts just to raise the same local dollars and equal state funding.

As one studies the impact of per-pupil expenditures on achievement, it is important to consider possible equity issues with respect to state formulae. Some school districts have a higher percentage of English Language Learning students or more low SES students. Other districts have more expensive fixed costs due to their location or area wages standards. Ideally, state formulae do not penalize poorer districts due to their lower property values, limit the use of categorical funds, and weight the distribution of state funds to account for students and districts that have costlier educational needs (Grubb, 2009).

**Funding adequacy.** Litigation with respect to state funding equity gave way to funding adequacy proceedings as litigants challenged the amount of state funds distributed to districts. Adequacy theory argues that children are denied the right to an adequate level of education according to the education clauses in state constitutions (Tang, 2011). States have hired researchers to do cost function analyses in order to determine the adequacy target for funding student education.

Adequate funding has been a natural response for school districts as they have had standards, assessments, and penalties imposed on them without addition funding. Schrag (2003) stated that, “If a state demands that schools and students be accountable - for meeting standards,
for passing exit exams and other tests – the state must be held equally accountable for providing the wherewithal to enable them to do it” (p. 246). The challenge for states has come in defining adequacy. State constitutions are varied in their descriptions of the term and though adequate typically implies minimal, the courts have consistently indicated an interpretation that implies one should have skills to make them a productive worker and citizen in a highly technical 21st century workforce (Rebell, 2011). It has been a challenge for states to meet the standard of adequacy set before them due to recession driven shortfalls in funding.

**Resource allocation and student achievement.** Since the 1966 Coleman Report asserted that the influence of family and school peers had a much larger impact on student achievement than school inputs, numerous research studies have been conducted in an attempt to connect educational inputs to student achievement (Venteicher, 2005). Researchers have identified these studies as analyses of the “educational production function” and have positioned themselves in two camps as to whether the “function” is broken in American public education (Krueger, 2002). Production functions are based on the theory that the level of output or what is produced (achievement) can be controlled by the level of input (educational resources).

Researchers in the last decade began to look at educational inputs and achievement from more of a cost function approach as the argument of adequate resources with respect to state funding found its way into the court system. The theory of a cost function approach to achievement considers the current dollars expended to obtain the current level achievement (cost for level of achievement) and then determines the additional cost necessary to achieve proficiency as defined by a state’s Annual Performance Report (APR). Some researchers have used both theoretical approaches with respect to their data in an attempt to determine the relationship between resources and achievement.
**Production functions.** Studies since 1966 seem to indicate that school district expenditures per pupil have little impact on student or district achievement. Of the 163 production functions estimates analyzing per-pupil expenditures and student performance published by 1995, only 27% of the estimated coefficients were positive (Hanushek, 2003). Conversely, Krueger would argue that Hanushek’s methods of analysis with respect to estimates on educational resources is fundamentally flawed as multiple estimates are derived from the same study and each given equal weight as that of a study with one estimate (Krueger, 2003). This widely publicized controversy between Krueger and Hanushek as it relates to the educational inputs and class size has direct bearing on this study as costs related to smaller class sizes have a large impact on per-pupil expenditures.

Increasing resources to school districts in an effort to positively impact achievement is a risky proposition if those resources are applied by districts in line with historical expenditures (Hanushek, 2003). School districts are relatively ineffective in delineating programs that have a positive impact on student and district achievement. Therefore, budgetary funds are often expended on goods and programs that have little to no effect on achievement (Grubb, 2009). As with the class size reduction debate, the real question is not so much if student achievement will increase, but rather what are the best investments to improve student achievement (Rice, 2002).

**Cost functions.** Cost function analyses of education inputs and achievement outputs have been used in response to adequacy litigation to determine acceptable educational targets. The theory proponents assert that one should be able to determine the current educational costs for current achievement levels and then extrapolate the necessary cost to reach a desired achievement level. As with most theories, there are skeptics that would assert that although this approach can produce valuable information with respect to spending characteristics and specific
groups of students, it is a stretch to assume that one can therefore calculate the cost to achieve a prescribed level of performance (Costrell, Hanushek, & Loeb, 2008).

Cost function analyses can be relatively simple as done in Missouri where high performing districts are used to calculate the State Adequacy Target. The premise is that these districts are hitting the mark and therefore the cost they expend to obtain that achievement level should be adequate for all districts in the state. This method has some flaws in that it does not take into account the demographics of different school districts (Lee, 2010). Hypothetically, districts with a higher percentage of low SES students, ELL students, or more students requiring special services would have a greater cost to bring students to proficient levels of performance. Although Missouri does try to correct for this by weighting attendance for these groups of students, the question remains as to whether this is an adequate correction. Cost function analysis can also be quite complex as seen in the work of Reschovsky and Imazeki where they predict spending costs for each district in the state studied (Lee, 2010).

**Summary.** This study of per-pupil expenditures and achievement was framed around public school funding, recent litigation in funding equity and adequacy, and theory specific to production and cost functions. It also looked specifically at how those theories have impacted expenditures and achievement in Missouri school districts. This study contained a unique component in that data over two years when the nation and Missouri were in the midst of its worst recession since the Great Depression were considered.

**Research Questions**

The following research questions were addressed in this study:

RQ1: What is the relationship between per-pupil expenditure and attendance rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?
RQ2: What is the relationship between per-pupil expenditure and graduation rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

RQ3: What is the relationship between per-pupil expenditure and MAP scores in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

**Hypotheses**

In order to address the research questions of this study the following hypotheses were tested:

H1\(_{Null}\): There is no relationship between per-pupil expenditure and attendance rates in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

H2\(_{Null}\): There is no relationship between per-pupil expenditure and graduation rates in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

H3\(_{Null}\): There is no relationship between per-pupil expenditure and MAP scores in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

**Methodology**

Qualitative research is interested in understanding the meaning people have constructed and the researcher often selects the instrument (survey), collects, and analyzes the data. It is an inductive strategy and is typically very descriptive, using words and pictures as opposed to numbers (Merriam, 1998). A quantitative research study typically takes a positivist perspective, that is a stance that phenomenon can typically be explained through objective reality and expressed numerically (Merriam, 1998). This particular study was best approached through quantitative research as opposed to qualitative as it was an examination of archival school district data to determine if a predictor variable (per-pupil expenditures) impacts criterion variables.
(attendance rate, graduation rate, and MAP scores). Quantitative research relies on numbers, tests, measurement, and numerical relationships and explanations (McMillan, 1996).

The researcher used moderated multiple linear regression to analyze the predictability of per-pupil expenditure on the criterion variables attendance rate, graduation rate, and MAP score, while moderating or testing the interaction over the years 2010 and 2011. Multiple linear regression is used to look at one or more predictor variables that may forecast criterion variables. Multiple regression allows the researcher to use multiple variables and is an appropriate analysis for nonexperimental or quasiexperimental research (Keith, 2006). Use of moderated multiple regression also allowed the researcher to analyze the interaction or moderated variable (year) with respect to the predictor variable (per-pupil expenditure).

Archival data were obtained from the Missouri Department of Elementary and Secondary Education (MoDESE) in the form of attendance rates, graduation rates, and MAP scores through their public data portal. CTB/McGraw-Hill LLC, developer and publisher of the MAP assessments, has done several analyses for validity and reliability which affirm that the test measures student’s progress with respect to the Missouri learning outcomes and that the tests are consistent over time. The 2011 Addendum to the 2010 Technical Report CTB/McGraw-Hill (2011) found that overall, MAP assessments, including each grade/content areas, were reliable.

Moderated multiple regression analyses were conducted to determine the strengths of the relationships between per-pupil expenditure and achievement outcome variables. A multiple regression analysis is used to determine the magnitude of the relationship between predictor variables and a criterion, or outcome, variable (Gall, Gall, & Borg, 2007). When using a moderator variable in multiple regressions, one is testing how the variable impacts the predictor variables’ influence on the criterion variable. Achievement outcomes were specifically measured
in terms of school district attendance rates, graduation rates, and MAP scores. The predictor variable, per-pupil expenditures, included in the regression analysis was evaluated with the moderator variable years (2010, 2011) in order to test the impact over two years of budget cuts for a large number of school districts. The population of interest was the public school districts in the state of Missouri. From a total of 522 public school districts in the state of Missouri, 267 public school districts in the state that had an average daily attendance per grade-level of at least 40 in 2011, graduation and attendance rates greater than zero in 2010 to 2011, MAP mean scores in 3rd through 8th grade communication arts and math for 2010 and 2011, MAP mean scores in 5th and 8th grade science for 2010 and 2011, and MAP End-of-Course mean scores in English 2, Algebra 1, Biology 1, and Government for 2010 and 2011 were analyzed. Districts included in the study are dispersed across the state of Missouri.

**Significance of the Study**

As schools and districts strive to meet the needs of 21st century students, the necessity to maximize efficient use of scarce resources has become a priority for educators as well as policy makers. This study may provide insight to specific inputs that can potentially positively impact student achievement. Much debate has centered around how effective school districts are in utilizing their current resources and accessing the impact of programs on student achievement (Odden, 2012; Odden & Picus, 2011; Picus, 2000). Findings from this study may help educators evaluate the impact of spending cuts on student achievement and encourage them to review program effectiveness in their districts. In light of recent adequacy litigation, this study can promote further study on developing equitable resource models for states and better measures of adequate state funding for schools. At the local level this study can provide decision-makers with information on how to better allocate resources.
Limitations of the Study

This study specifically examined Missouri school districts and relied on the accuracy of Core Data reported to the Department of Secondary and Elementary Education as well as assessment data collected by DESE from various testing entities. With such a large database, some errors will naturally occur in reporting and posting. Most of these errors are corrected in a timely fashion, as testing data are now highly scrutinized by school officials and DESE officials due to its influence on school accountability with respect to Adequate Yearly Progress (AYP) and Annual Performance Reports (APR).

Data in this study were not disaggregated by gender, race, socioeconomic status, English language proficiency, or disability. The study specifically focused on expenditures and achievement at the district level. This limits the ability to make generalization with respect to the results as it pertains to specific groups of students and schools.

The study was also limited in that only Missouri school districts were examined. Each state has unique features with respect to funding, certification requirements, minimum district size, compulsory education requirements, and state assessment correlation to national standards and national standardized assessments. The results of this study are unique to Missouri and do not suggest application to other states or the nation as a whole; instead, these results may provide the foundation for a broader investigation of the inputs and outputs examined.

Summary

A substantial increase in educational spending across the United States in the last century has not removed the need for educational reform or eliminated inequities in educational inputs and achievement (Grubb, 2009). The impact of increased educational funding has been well researched in the last four decades without a definitive conclusion. Krueger (2002 & 2003) and
Nye, Hedges and Konstantopoulos (2001, 2002 & 2004) have argued that resources used to reduce class sizes can increase student achievement, whereas Hanushek (2003) maintains that the only indicator that seems to impact student achievement is teacher test scores (IQ or achievement tests) and that correlation is minimal at best.

Recent litigation on state funding adequacy and equity has added complexity to the resource and student achievement debate. Only the states of Delaware, Hawaii, Mississippi, Nevada, and Utah have avoided a challenge of their state funding mechanisms in the courts (Podgursky et al., 2008). Missouri has seen two challenges to their funding formulas in recent years in conjunction with recession obstacles related to the SB287 formula phase-in process. During this process, many school districts across Missouri reduced their per-pupil expenditures in response to the department of education’s underfunding of the SB287. The purpose of this study was to identify whether a relationship exists between per-pupil expenditure and student achievement over this time frame. This study may be useful for educators and policy makers in determining policy and guidelines for future resource allocation to best impact student achievement.

Chapter One included an introduction to the study, background information, a statement of the problem, the purpose of the study, a theoretical framework, research questions and hypotheses, the nature of the study, and limitations of the study. A review of the literature that is applicable to the study is presented in Chapter Two. Chapter Three contains the methodology for the study. Presented in Chapter Four is the analysis of data and findings for the study. Finally, Chapter Five includes the conclusions from the data analysis as well as recommendations for further study and recommendations for practice.
CHAPTER 2
LITERATURE REVIEW

The purpose of this study was to examine per-pupil expenditure and student achievement in 267 Missouri public school districts to ascertain if per-pupil expenditures predict MAP scores, attendance rates, and graduation rate from 2010 to 2011. Examined in this literature review were sources of public education revenues available for district expenditure, the distribution of those revenues at the national, state, and local levels, the equity and adequacy funding issues that have been litigated with respect to distribution and level of funds, and the past research connecting educational inputs to student achievement. Also considered was the historical impact of these issues, specific to the state of Missouri, and the national transition of educational leaders to a more entrepreneurial approach in efficient use of resources.

This review was undertaken in an attempt to give a fair assessment of the school input connection to student achievement debated that has spanned the last four decades in research. Two camps have emerged over that time span and summary reports of studies have been presented and debated. In the latter part of this time-frame, equity and adequacy have entered the discussion through state litigation. This review looked at the impact of those court cases and state funding models to examine their ties to per-pupil expenditures. This study was specific to the state of Missouri and as such merits a review of factors specific to the State that may have a bearing on per-pupil expenditures.

The sources of information for this review included journal articles, books, working papers, consortium reviews, state and national reports, online resources, conversations, workshops and conferences with Missouri and National School Business Officials, legislation,
and court documents. The author is a chief financial officer for a mid-Missouri public school district and 25 year veteran of public education in Missouri, having served at the middle school, high school, and district level in seven different school districts with enrollments from 3,000 to 19,000. An attempt was made to present the most current research related to the study as well as historically relevant data. School finance is in a volatile state due largely to the recent recession and as such; potential impacts thereof must also be considered in a study of per-pupil expenditures.

**Public School Funding Sources**

Public school funding in the United States is generally composed of federal, state, and local revenues. The breakdown of these revenues for school districts has been fairly evenly split between the state and local level while federal funds have been around 7-8% for the last decade (Grubb, 2009; Hanushek, 2003) The exception came in 2009 and extended into 2010 when federal funds increased by 17% and state funding fell by 3%, putting federal revenues distributed to school districts at around 10% due to the influx of federal funds through the American Recovery and Reinvestment Act of 2009 (Johnson, Zhou, & Nakamoto, 2011). The source of public school funding has shifted over the last century. In 1920, local budgets and property taxes were the main source of funding with 80% of the revenue coming from local sources (Hightower et al., 2010). This funding split was in line with the common belief of the time that education was a local responsibility and local boards should make the educational decisions for their schools.

**Federal funding.** Federal resources are typically tied to a specific classification of students (special education, at-risk, students with parents in the military, etc.), programs (title, vocational, or lunch programs), or grants (homeless, early childhood, etc.). These resources are
closely tracked and audited, typically funded with a per-pupil or participation rate calculation, and must be expensed according to the guidelines of the program. Federal funds may be annual programs that require a state matching portion, such as Perkins funds (Federal Vocational Education funds) or Early Childhood Special Educational funds, or one time competitive grants, such as the Impact Aide Construction grants. Regardless, with the exception of Impact Aide (aide to schools for students whose parent(s) are employed by the federal government and non-taxed federal lands within their districts), federal revenues are very limited in how they can be expended by the school districts (Grubb, 2009). Some federal funds and federal throw-through funds (federal funds allocated to states for distribution) also require that the school district commit a portion of local funds to the program in order to qualify for the federal assistance. Vocational – Technical Education Enhancement Grants established through the Outstanding Schools Act of 1993, require school districts to contribute 25% of local dollars to equipment purchases and 50% to instructional purchases (Hoge, 2012).

Federal funds for public schools received a huge boost in the 1960s as the Office of Education saw its budget increase from $1.5 billion to $4 billion. This increase in funds came with the passage of the Elementary and Secondary Education Act (ESEA) in 1965 and the Vocational Education Act in 1963 (Hanna, 2005). The federal government used the Civil Rights Act of 1964, desegregation laws, and Title I funds, to ensure compliance, especially in Southern states. This forced compliance continues today with special education regulations and No Child Left Behind. ESEA and the Civil Rights Act forced a change in who was allowed into schools, but it did not determine what a student would learn, as NCLB has attempted to do (Hanna, 2005). Federal compliance is entering a new era as many states have chosen to create ESEA waiver applications in lieu of NCLB sanctions. With federal funding typically limited to less than 8% of
school districts’ revenues, federal funds are not sufficient to fund IDEA mandates, let alone the
cost of meeting NCLB (Grubb, 2009).

It is essential that the federal government begin to fund mandates imposed on schools and
 districts. IDEA was authorized in 1975 and reauthorized in 2004, but funding promises by
Congress have still not been met. States and local districts are left to fund the ever-increasing
costs of educating students with disabilities. Originally, federal funding was promised at 40% of
the national average per-pupil expenditure (APPE) for each special education student. To date,
the highest amount that Congress has funded IDEA is 18.51% and it has dropped since. In an
answer to thirty years of underfunding, several entities with educational ties joined forces to
develop the IDEA Funding Coalition (2006). They developed a full-funding implementation
timeline that moved funding of IDEA to mandatory spending as opposed to discretionary funds
and would have had IDEA fully funded by 2012. At current funding levels, it would be 2035
before Congress would be able to reach full funding at 40% (IDEA Funding Coalition, 2006).
Congressional funding of the cost of mandates such as IDEA and NCLB would free up local and
state dollars to support the achievement of all students.

**State funding.** State funding has some of the same characteristics as funding at the
federal level with respect to programs (special education, early childhood special education,
transportation, etc.); however, the basic formulas for state funding are as varied as the number of
states in the nation. Over the last century public school funding has shifted from a local effort to
a nearly equal split between state and local funds. In fiscal year 2008, 14 states generated sales
tax revenue for schools, 22 states supported schools with at least a portion of a lottery, and
around 21% of total state expenditures went to fund elementary and secondary education
(Hightower et al., 2010).
State funding distribution methods have changed significantly over the last four decades largely due to equity and adequacy litigation. Traditionally many states’ distribution of funds to local school districts were flawed in that poorer districts were required to tax themselves at higher rates just to secure the same state funding as neighboring rich districts (Hanushek & Lindseth, 2009; Rebell & Wolff, 2008). In 2008, thirty-seven states and the District of Columbia used a foundation formula as their method for distribution of funds to school districts; additionally, 46 states used some type of weighting or adjustment to their distribution method in order to allocate more dollars to particular districts, schools, or groups of students (Hightower et al., 2010).

The idea of a foundation formula dates back to 1920s New York when Strayer and Haig developed a plan that provided equalizing grants to poorer districts that could not raise sufficient tax revenue to fund their schools (Hanushek & Lindseth, 2009). Current foundation formulae are typically based on the premise that there is a targeted cost per student in order to provide an adequate education in the state. Some states use a cost function analysis to determine this target, while others, such as the state of Missouri, use the average cost per pupil of high performing districts. Missouri also removes outliers from the range of high performing districts to obtain a better average.

A foundation formula alone may not take into account higher educational costs associated with specific groups of students such as Limited English Proficient students (LEP), students on Individual Education Plans (IEP), or students from lower income background, typically determined by Free and Reduced Lunch (F&RL) status (Hanushek & Lindseth, 2009; Hightower et al., 2010). Depending on the distribution of resources across the state, the size of the state, and the location of the state in the nation, there may be significant cost disparities from one school
district to another that need to be accounted for in the allocation of funds. The Missouri formula accounts for this potential disparity in costs by calculating the Dollar Value Modifier (DVM). The DVM is calculated on an annual basis and applied to the product of a district’s weighted average daily attendance (WADA) and the state adequacy target (SAT) to determine the funding needed for each school district. The DVM is calculated using prior years’ county prevailing wage data to determine the relative cost of goods and services from county to county across the state.

By using WADA to calculate funding for school districts in Missouri, the formula provides more funding to districts that have a greater number of LEP, IEP, or F&RL students than the average (threshold percentages) of the high performing school districts. These threshold percentages and the state adequacy target are recalculated every two years and new values are phased into the formula over two years. These weights and adjustments help to create an equitable formula, but the state of Missouri has been unable to adequately fund the formula since 2008-09, the third year of its seven year phase-in plan.

As of fiscal year 2008, all states apart from Tennessee also used categorical funds to distribute revenue to school districts based on specific programs, operational functions, or activities (Hightower et al., 2010). These funds may be tied to IEP students, food services, transportation, or any number of programs. Categorical funds can be remnants of the old systems of distribution in that their allocation may be based on judgment rather than statistically backed need or performance criteria. The wide-spread use of categorical funds not only creates unnecessary accounting and documentation, but also reflects an unwillingness of states to allow districts and schools the power to make education funding decisions (Hanushek & Lindseth, 2009). The state of Missouri rolled the categorical funds of exceptional pupil, gifted education,
remedial reading, fair share, and free textbook into their new foundation formula in 2006-07, which effectively eliminated most of the categorical funds not tied to federal matching funds.

**Local funding.** Local funding for public schools is generally garnered in the form of a tax on assessed property within district boundaries. In 2002, local property tax accounted for 75% of all local school funding (Hanushek & Lindseth, 2009). The disparity of property wealth from district to district even within the same region can create vastly different tax rates to generate the same revenue, as was presented in the 1973 case of *San Antonio Independent School District v. Rodriguez* (Rebell, 2011). Where state funding has been tied to local property taxes, these disparities have led to equity challenges in the state courts. States have responded to equity challenges by limiting the local property taxes that school districts can assess. Though most restrictions on property taxes can be overridden with voter approval, by 2008, twenty-eight states had capped or limited property tax revenues, the property tax rate, increases in tax rates, and/or increases in property tax revenues (Hightower et al., 2010).

In Missouri, local school boards set the tax levy for their political subdivision (school district) each August. The debt service levy must be set to cover principal, interest, and fee costs on the district’s capital bond obligations for the fiscal year. The operating levy is set based on the last voter approved levy and the district’s tax rate ceiling. The Hancock Amendment to the Missouri Constitution also limits any percentage increase to the operating levy at no more than the prior year’s consumer price index once the new construction assessment amount is excluded (Hembree, 2004). These limitations do not preclude school districts from setting higher levies than neighboring school districts and thus creating disparity in per-pupil expenditures.

**Additional funding sources.** As schools and districts experience difficult financial times, they are forced to turn to new funding sources in order to continue to provide the same
quality of educational services. Among these sources are school foundations, joint capital ventures with the community, grants, private donations, fundraisers, student fees for some classes and activities, and parent volunteers or “in kind” donations such as land, facilities, or classroom equipment. School officials must draw on their entrepreneurial skills in raising funds to support school programs. They must think “outside the box” in developing new funding streams.

All states and the District of Columbia permit school districts to generate revenue from private sources and some districts and communities have formed foundations that receive donations to support schools (Hightower et al., 2010). School foundations across the nation have grown at a very rapid pace. These foundations provide a conduit for anonymous tax deductible contributions to be funneled into schools in the form of teacher or classroom grants and program supports (Davies & Hentschke, 2002). Schools and districts are also pooling resources with communities to stretch tax dollars and maximize the use of facilities. This can be seen across the nation in joint ventures such as capital outlay for libraries, athletic facilities, and performing arts centers. Out of necessity, schools and school officials have increased their pursuit of private donations to fund or partially fund school projects.

Schools also seek annual donations to programs by individuals that have vested interest in the programs. Parent donations have become an integral part of the school funding equation. These donations are increasingly going beyond the traditional fund-raising and volunteer time to the donation of professional services. This source of funding can be very lucrative for a school or district, but must be monitored carefully due to liability issues with voluntary services, “prevailing wage” requirements, and the potential to widen inequities that already exist between districts and within schools. Discrepancies in the quality of schooling offered to children and
communities of wealth relative to poorer communities and their children have been well documented in state court cases challenging educational equity (Rebell & Wolff, 2008). Unfortunately, districts of wealth naturally have a greater propensity to secure donations to foundations than poorer districts, and thus these alternative funding sources, although well-meaning, can effectively widen the funding gap.

**Funding Equity and Adequacy**

The fight for educational equity in the United States can be traced back to the earliest settlers, as typically only young men of promise and appropriate social standing were given the investment of any formal educational training. Litigation on educational equity took a turn in recent history under the equal protection clause of the United States Constitution. Notably, in 1973, as the United States Supreme Court maintained that education is not a “fundamental interest” under the federal Constitution in their review of *Rodriguez v. San Antonio Independent School District* (Rebell, 2011). In light of this development, equal protection with respect to education cases has been litigated at the state level citing state constitutional equal protection clauses.

**Funding equity.** In the desegregation era, the federal government effectively enforced compliance through the threat of withholding federal funds under the authority of Title VI of the Civil Rights Act (Rebell & Wolff, 2008). With the move of funding equity challenges in public schools from the federal stage to the state level, state revenue distribution changes were implemented in many states across the nation. Using the power of state equal protection clause, *Serrano v. Priest* in California led the charge to transform state funding formulae by finding that education was a “fundamental interest” in the state constitution (Hanushek & Lindseth, 2009). This case led to a focus by states on equal per-pupil expenditures across districts and elimination
of inequities caused by distribution formula inappropriately weighting local property taxes. Unfortunately, the advance of equity in California did not guarantee additional funds to level-up to equity and limits on property taxation caused average revenues for schools to decline (Grubb, 2009). By 2007, nearly forty states were involved in equity lawsuits with respect to their funding distribution formulae and just less than half of these cases were won by the plaintiffs (Hanushek & Lindseth, 2009).

Missouri was one of those states that had their funding distribution challenged in the courts with respect to equity. Committee for Educational Equality v. State of Missouri (1993) found the Missouri school finance formula unconstitutional on the ground of inequity associated with property tax (Podgursky et al., 2008). The formula was revised in an effort to equalize funding between school districts, as directed by the state legislature, with the passage of the School Improvement Act of 1993. This revision (Senate Bill 380) was ambitious in that it made funding guarantees to poorer districts and the state was not able to meet funding targets of the formula (Podgursky et al., 2008). This eventually led to questions with respect to the adequacy of funding of SB 380.

Problems similar to those with SB 380 in other states pushed plaintiffs to consider new methods to reform state funding formulae. States were leveling-down funding rather than leveling-up to equitable funding and plaintiffs were losing more equity cases than they were winning (Hanushek & Lindseth, 2009). This led funding advocates to consider arguments on the grounds of adequate educational opportunity, such as was presented to the Kentucky Supreme Court in Rose v. Council for Better Education (1989).

**Funding adequacy.** Many state funding formulas have come under scrutiny for their lack of adequate funding to school districts. The measure of adequacy has become a bitter debate
between state governments and educational groups. In 1989, the Kentucky Supreme Court declared their state’s public education system unconstitutional, proclaiming that all students in their state had a right to adequate educational opportunity according to their state constitution (*Rose v. Council for Better Education*, 1989). Using this declaration as a guide along with various educational cost analyses, advocates have challenged the adequacy of their states’ funding distributions in the state courts. Adequacy claims differ from equity claims in that they are typically based on educational clauses rather than state equal protection clauses (Hanushek & Lindseth, 2009). Educational clauses in state constitutions make guarantees of some form of free public education for children of the state and vary from state to state on their degree of detail.

Various professional methods have been used across the nation to determine adequate funding. Since 1990, at least 39 states have had adequate funding determination studies conducted with respect to their educational costs (Rebell, 2011). Some studies have used cost function analyses to determine the cost of a current level of performance and then projected the necessary cost to move students to a proficient level of performance. Two other common adequacy study methods employ “professional judgment” and “successful schools” techniques. The professional judgment approach is based on a panel of educators and administrators estimating the cost for students to meet achievement goals. A successful schools technique is based on cost data from districts currently meeting state achievement standards to determine an adequacy target for per-pupil funding.

Depending on the adequacy determination method employed, adequate funding per-pupil can vary widely. Rubenstein estimated that an additional $15.6 to $18.5 billion is necessary to adequately fund our nation’s schools to the cost-adjusted national median of current per-pupil expenditures (2002). As of 2009, only five states had not seen their school funding distribution
challenged in the courts and 23 states saw theirs determined unconstitutional on the premise of adequacy (Podgursky et al., 2008). Some state courts have gone so far as to define the characteristics of adequate education which include oral and written communication skills as well as an understanding of governmental processes (Rose v. Council, 1989).

Missouri’s SB 380 came under pressure of possible litigation in 2004 from school districts due the state’s unwillingness to fully fund the formula. In response, the Missouri School Boards Association commissioned “professional judgment” and “successful schools” adequate cost analyses (Podgursky et al., 2008). As a result, and in an attempt to avoid litigation, the legislature passed Senate Bill 287 in 2005 (the current foundation formula) that was based on the results from the “successful schools” study. A coalition of Missouri school districts continued with their suit challenging the adequacy of the new formula only to see the Missouri Circuit Court find in favor of the defendants in 2007 (Podgursky et al., 2008). As a result, Missouri is in its first year with SB 287 completely phased in and the state was funding the formula at just over 92% in September of 2012 (Missouri Department of Elementary and Secondary Education, 2012).

Funding adequacy continues on the national forefront, but the recent national data are very similar to the Missouri reality and not nearly as promising as the projections from courtroom victories. Public schools in Kansas were to see a 26% increase in funds, New York a 30% increase, and Arkansas over a 17% increase (Rebell & Wolff, 2008). Unfortunately, many states have had to cut funding to schools due to the recent recession. Kansas has experienced months of withholding funds from schools. Vermont appears to be one of the few states that had the forethought in the adequacy process to designate recession-proof funding streams to support
their funding commitment to public schools (Rebell, 2011). They are one state that has not cut funding to schools throughout the recession downturn.

**Attempts to equalize resources.** A necessary component to adequate state and national funding is the equalization of human resources across the state. Several states have already developed student loan forgiveness programs that will potentially attract new teachers to their states. These programs are directed at attracting teachers of color and teachers in hard-to-staff certification areas, as well as providing incentives to work in academically poorer areas within their states (American Federation of Teachers, 2008). These programs are a good starting point for providing equitable education for all, but the rewards are not great enough to make a lasting impression. Other methods such as bonuses or alternate salary schedules to encourage teachers to work in high-need schools have not been proven cost-effective (Imazeki, 2008). These programs often target new teachers to the field of education rather than experienced teachers that could have a greater impact in high-need schools. Incentive programs need to reflect the competitive nature of the entrepreneurial leader and take into consideration current data on quality teacher characteristics.

Connecticut is an example of this type of thinking with their Teacher Mortgage Assistance Program through the Connecticut Housing Finance Authority. This program provides a reduced interest rate (currently three-tenths of a percent) to first time home buyers that teach in Priority Districts, Transitional Districts, or State-identified subject matter shortage areas. The program does, however, have limits on purchase price and maximum household income level that some may find restrictive (Connecticut Housing Finance Authority, 2008). Some may find that three-tenths of a percent is not a significant financial gain, but over the life of a mortgage on a $300,000 home, it may amount to as much as $17,000. This plan to attract teachers to high
need areas and subject matter shortage areas is particularly intriguing because it encourages the teacher to make a potentially long-term commitment to the community. Other incentive programs to entice quality teachers to work in high-needs schools have been attempted by government entities such as the U.S. Department of Education’s Teacher Incentive Grant program. Unfortunately, it will take a much larger initiative to assure equitable distribution of quality teachers across the nation as currently only two school districts in Missouri are participating in this program (U.S. Department of Education, 2007).

**Resource Allocation and Student Achievement**

When examining an educational issue, it is important to consider the impact on student achievement. There are decades of research with respect to school resources and the impact on student achievement. The Coleman Report (1966) has been the accepted assessment of the research community with respect to school resources and student achievement into the 1990s. This report found no positive correlation between school resources and student achievement. It spurred much debate on value added by schools and asserted that “…schools bring little influence to bear on a child’s achievement that is independent of his background and general social context” (Ferguson, 1991, p. 468).

Most of these research studies can be categorized as either a production function approach, or more recently, a cost function (econometric function) approach. Production functions are the more traditional approach as they look at the impact of educational inputs on student, school, and district achievement. These studies as a whole have been fairly inconclusive as to the impact of educational inputs on achievement (Hanushek & Lindseth, 2009).

Cost functions have become a popular choice of educational advocates with the transition of state funding litigation from equity to adequacy, as it allows one to theoretically project what
funding is necessary for students to perform at a prescribed achievement level (Guthrie & Springer, 2007). The cost function approach has been successful in the private sector, but may not be as effective in the education arena given demands such as smaller classes, more elective classes, automatic pay increases, and costly benefit plans that have historically been shown not to positively impact student achievement (Costrell, Hanushek, & Loeb, 2008; Odden, 2012; Odden et al, 2008; Odden & Picus, 2011). The “professional judgment” method of cost function has come under the most scrutiny due to its subjective nature.

**Production functions.** Production function research has been the dominant method over the last four decades in studies comparing school inputs and achievement. Hanushek (2003) has identified the common framework of this research as follows; “Student achievement at a point in time is related to the primary inputs: family influences, peers, and schools. The educational process is also cumulative, so that both historical and contemporaneous inputs influence current performance” (p. 74). Research since the Coleman Report (1966) has attempted to quantify those inputs of schooling that impact student achievement and the degree of impact. Isolating those effective inputs and their impact has often led to policy that allocates resources through additional federal, state, or local revenue or addition funding for grants, programs, and models aimed to improve student achievement. Examples include voter approved sin tax (taxes on vises such as alcohol, cigarettes, or gambling) revenues allocated by states to fund pre-school programs, Title I programs, professional learning communities, response to intervention, teacher retention and recruitment programs for rural, urban, and high-need content area, and smaller learning communities, just to name a few. Unfortunately, revenue sources such as the tax on gambling in Missouri that generates revenues identified as Classroom Trust Funds are negatively impacted by events such as the recent recession and new gambling venues in neighboring states.
Hanushek (1997, 2003) conducted a summary analysis of 376 educational production functions on student achievement that measured teacher-pupil ratio, teacher education, teacher experience, teacher salary, expenditures per pupil, facilities, administration, and teacher test scores. The 41 teacher test score studies (these studies correlated teacher performance on IQ tests or other achievement tests to student achievement) presented the strongest data that educational inputs impact student achievement. Of these 41 studies, 37% were positive and statistically significant; however, that still left 10% that were negative and significant, as well as 53% that were statistically insignificant. Hanushek (2003) concluded, “…the vast number of estimated real resource effects gives little confidence that just adding more of any of the specific resources to schools will lead to a boost in student achievement” (p.76).

Odden (1994) also pointed out that student achievement has lagged well behind expenditures per pupil in the last 40 years and systemic change must occur if students are expected to reach new levels of achievement. Expensive changes in education such as PL 94-142 (Individuals with Disabilities Education Act of 1975) can account for some of this increase in per student expenditure, but over a 30-year time period, student expenditures saw a 205% increase while student achievement was flat and even decreased in the late 1960s and early 1970s (Hanushek, 1986; Odden, 1994). With “No Child Left Behind” (NCLB), educational institutions have even greater demands on resources, as they make critical decisions about programs and their impact on Adequate Yearly Progress (AYP). As the emphasis on educating all students continues, so will the demands for support programs to assist struggling learners.

A recent push in the last decade to identify resource inputs that have a measurable impact on student achievement has led researchers to look at multiple variable models and non-traditional methods to analyze resources and student achievement (Knoeppel et al., 2007). By
using canonical analysis, Knoeppel et al. were able to identify statistically significant
relationships between teacher quality, as measured by average salary, and student achievement,
as well as other inputs such as local wealth, per-pupil expenditures, and total number of days
attended during the year (2007).

Teacher quality became an area of focus with NCLB, yet the characteristics of a quality
teacher were left up to states to define and seldom placed additional requirements on existing
teachers or new entrants to the profession (Hanushek & Rivkin, 2010b). Characteristics of
teacher quality are often identified as appropriate certification, a degree major or minor in their
assignment area, initial success on licensure exams, mastery of pedagogy, experience, and high
performance on standardized assessments (Peske & Haycock, 2006). More recently the measure
of teacher quality has transition to value-added in student achievement. Though past connections
were often difficult to make between individual teacher characteristics and student achievement,
value-added models have shown that students have a .11 standard deviation increase in reading
and .15 standard deviation increase in math with a single standard deviation increase in teacher
quality (Hanushek & Rivkin, 2010a). Though individual characteristics such as certification do
not assure teacher quality, the work of Peske and Haycock (2006) clearly shows the inequitable
distribution of minimally qualified teachers has a detrimental effect on schools with high
poverty and a high percentage of students of color. This work points out the disporportionate
number of uncertified, unexperienced, and ineffective teachers in schools that need the most
qualified professionals. Haycock, Lankford and Olson (2004) state that, “typically, and this is the
case across the country, students who are most dependent upon their teachers for academic
learning are systematically assigned to teachers with the weakest knowledge and skills” (p.230).
This systematic barrier to social capital must be remedied through the reallocation of effective teachers within districts and within schools.

In their work on reallocating educational resources within school districts and buildings, Odden and Picus (2011) suggest that evidence on class size reduction be considered in light of the impact that the Student Teacher Achievement Ratio study (STAR) in Tennessee has shown on student achievement. This study of 79 elementary schools in Tennessee revealed that reducing kindergarten through 3rd grade class size to 13-17 students as opposed to 22-26 students had a lasting impact on student achievement even through their 9th grade test scores (Nye et al., 2002, 2004). The study included 42 of Tennessee’s 141 school districts and randomly assigned K-3rd grade students to small classes, large classes, and large classes with a teachers aide. Evidence also suggests that the impact is even more significant for students of color and students of lower socioeconomic status (Nye et al., 2002, 2004). These results contradict research on class size presented by Hanushek (2002) who has taken a historical approach to class size by studying natural occurring class size and resulting achievement scores and found the effect on achievement to be negligible at best.

Another recent study relating per-pupil expenditures and student achievement estimated that increasing per-pupil expenditure by $1,000 in a typical state would result in a gain of just over four points on the math portion of the SAT (Ram, 2004). This study found no significant correlation between the per-pupil expenditures and the verbal portion of the SAT. However, when the verbal component was combined with the math portion, a significant correlation was still present. Venteicher (2005) found in Missouri that graduation rates and Missouri Assessment Program (MAP) exams increase while ACT scores remain relatively flat as annual expenditure
growth slow from 4.7% to 2.7%. This would suggest that the economic downturn of the early 2000s had minimal to no negative impact on student achievement in that state.

A study involving data from Texas schools has shed new light on the relationship between school resources and student achievement. An analysis of Texas Examination of Current Administrators and Teachers (“TECAT”) scores, Texas Educational Assessment of Minimum Skills (“TEAMS”) student exam scores, school spending data, and census data revealed that a positive correlation exists between teacher scores and student performance (Ferguson, 1991). Ferguson (1991) identified high TECAT scores, specifically in the areas of literacy and math, and nine or more years of teaching experience, as characteristics that help to identify quality teachers and therefore have a positive impact on student test scores. His study also determined characteristics of the teacher market that influence quality teacher placement. These include the education level of adults in the community, the racial makeup of the community, and teacher salaries relative to surrounding districts and other occupations (Ferguson, 1991).

This study proposed that districts with higher salaries, adults with higher educational attainment and less diversity will attract teachers with higher TECAT scores and more years of experience. If this proposition is an accurate picture of quality teacher distribution in our nation, then a clear equity issue is raised for students living in poor or rural districts with high concentrations of poverty, such as urban and rural districts. This study, in conjunction with studies on race and earnings, not only documents the slow progress made towards race equity with equalization of school resources, but also highlights the work that must continue in pursuit of an equitable education for all students (Card & Krueger, 1996). Ferguson summarized that, “…hiring teachers with stronger literacy skills, hiring more teachers (when students-per-teacher
exceeds eighteen), retaining experienced teachers and attracting more teachers with advanced training are all measures that produce higher test scores in exchange for more money” (Ferguson, 1991, p. 485).

The largest portion of a school or district’s budget is spent annually on their most valued resource; the classroom teacher. Considering the study of Texas schools, government entities are challenged to bridge the salary gap for poorer or rural districts that cannot support a competitive salary schedule. The data now lead to the hypothesis that directing funding towards teacher salaries and developing incentives for quality teachers to serve in academically weak schools or districts can have a positive impact on student achievement. Given this challenge, school administrators are forced to draw on their entrepreneurial skills and work with government entities to move quality teachers into rural and academically poor schools.

The results of four decades of research have been inconclusive at best and have led researchers to study secondary resource factors such as teacher quality and to conduct varied analyses in efforts to determine variable correlations (Hanushek & Rivkin, 2010a; Haycock, Lankford, & Olson, 2004; Hedges, Laine, & Greenwald, 1994; Knoeppel, Verstegen, & Rinehart, 2007; Peske & Haycock, 2006; Sanders & Rivers, 1996). During this same timeframe, educational expenditures have continued their historical increase. Educational expenditures increased at a rate of 3.5% per year from 1890 to 1990 (Hanushek & Rivkin, 1997). In contrast, gains on the National Assessment of Educational Progress (NAEP) in reading, mathematics, and science for 17-year-olds in the United States from 1969 to 1999 were slight at best, and significantly lower in science (Hanushek, 2003).

Research that was once stagnant after the Coleman Report (1966) in the area of student achievement and per-pupil expenditure has been re-visited as those in the educational arena seek
to maximize limited revenues to meet the educational needs of all students. The research is much less conclusive with respect to the impact of per-pupil expenditure on student achievement. Recent studies have examined resource allocation at the building level and the impact on student achievement (Eaton, 2004).

Given the information gained from these production function studies, the resource that is often impacted most by funding issues in education, the classroom teacher, is also the one that possibly has the strongest connection to student achievement. The classroom teacher is the single variable that has the greatest influence on student learning (Knoeppel et al., 2007). Recent studies on the correlation between educational resources and student achievement have redefined the approach to evidence surrounding student-teacher interactions, teacher quality, and student achievement (Ballou, Sanders, & Wright, 2004; Hanushek & Rivkin, 2010a; Haycock, Lankford, & Olson, 2004; Peske & Haycock, 2006; Sanders & Rivers, 1996). This research shows the disproportionately low number of quality teachers in schools with high levels of poverty and students of color. The number of teachers without appropriate certification in low-poverty schools is 16.9 percent while in high poverty schools it is 29.6 percent (Haycock et al., 2004). The picture is similar when looking at teachers’ years of experience and their performance on teacher exams. These are disparities that school officials and government entities must heed if the goal is to provide not only a quality education to all, but an equitable one as well (Knoeppel et al., 2007; Ferguson, 1991; Card & Krueger, 1996).

Cost functions. As educational advocates began to experience defeats in the state courts with respect to funding equity, they turned their focus to public education clauses in state constitutions to pursue claims of state funding inadequacy. To measure the cost of an adequate educational system, researchers and consultants began to use cost function approaches to analyze
school inputs and achievement. The two common approaches are the “professional judgment” and “successful school” methods. The first uses estimates from administrators and educators whereas the latter extrapolates a cost from districts that are already meeting achievement standards.

A cost function study of Missouri schools found that the state was underfunding by $913 million in 2001-02 with SB 380 and by $800 with the formula revision SB 287 (Podgursky et al., 2008). Production function researchers question the validity of cost function approaches to achievement and school inputs largely due to methods employed, historical lack of correlation between school inputs and achievement, and vast differences between results by different researchers using the same state data (Costrell et al., 2008). A prime example of disparity in cost function analyses was presented in the 2004 case of *West Orange-Cove et al. v. Neeley et al.* that questioned the constitutionality of the Texas school finance system. A cost function study by the state of Texas found the level of educational funding adequate to meet state performance goals whereas the cost function study presented by over 300 school districts estimated that at least $2 billion in additional funds were necessary to reach such a level of performance (Imazeki & Reschovsky, 2005).

**Efficiency and Entrepreneurial Leadership**

As schools and districts access or develop new sources of funding, it is critical that school officials utilize their entrepreneurial skills in distribution of school resources. In an analysis of the financial business of a school or district it is important to start with the understanding that there are some inherent costs that most likely do not have a direct bearing on student achievement, or may be outside the realm of modification. These could include transportation costs, utility costs, and fuel costs, among others; however, even these costs need to be reassessed
periodically and in drastic times could be trimmed through a 4-day school week or a cooperative energy usage plan with utility companies. Districts across the nation continue to look for creative ways to cut costs in poor economic times (Adsit & Murdock, 2005).

Data have shown that quality teachers improve student achievement; thus, it is important to retain quality teachers (Archibald, 2006). To retain these teachers it is imperative to provide them with appropriate resources and cultivate a climate of innovation (Hentschke & Caldwell, 2005). It is also important to note that research has shown district and school leadership is second only to classroom instruction in contributing to what students learn in school (Leithwood, Seashore-Louis, Anderson & Wahlstom, 2004). School officials must encourage innovation and utilize the knowledge base in their districts and schools. By utilizing teacher leader expertise and developing cooperative research initiatives with professional researchers, districts promote teacher innovation, access relevant action research, and reduce professional development expenditures. Through this process, schools also become Knowledge Creating Schools that audit, create, validate, and disseminate knowledge (Hargreaves, 1999).

School officials must continue to take risks in the allocation of resources through maximizing buying power and outsourcing operations that cannot be handled cost effectively in-house. Many districts are finding a more efficient use of resources is to allow private business to take over high knowledge or specialty operations typically handled in-house, such as investment of assets, accounting and payroll, cleaning, food service, and maintenance (Davies & Hentschke, 2002). Districts must continue to look at beneficial partnerships and cooperatives that can maximize their buying power, such as the Cooperating School Districts of Greater Kansas City and the Cooperating School Districts of St. Louis (Cooperating School Districts of Greater Kansas City, 2007).
School administrators and community members look at assessments, data, demographic information, and various other measures of effective schools in order to determine where to allocate resources. Many districts have embraced School Improvement Initiatives (Success for All, Accelerated Schools Project, America’s Choice) to help them systemically allocate resources that will increase student achievement on local, state, and national assessments (Odden et al., 2008). National data are also somewhat helpful in this process, such as the evaluation of national testing trends or Advanced Placement data (U.S. Department of Education, 2004). Identifying weaknesses in threads of learning or content and process standards, combined with local and State assessment data broken down by subgroup, attendance, dropout, and persistence to graduation data, have been very helpful in targeting areas that need additional resources. As school leaders seek to make positive changes within their schools, support programs and interventions, such as tutoring programs, instructional coaches, and additional support staff, are recurring expenses in districts’ budgets.

Demands and accountability are on the increase, while limited state and federal dollars are often less than promised or come with unrealistic mandates. School officials find themselves in a new role as a “fund-raiser” in an attempt to provide a quality education for all that cannot be funded through local, state, and federal monies (Hentschke & Caldwell, 2005). In this new role, school officials find themselves involved in establishment of educational foundations, seeking an increasing number of grants, and soliciting funds from large donors to fund programs in their school districts. At the same time, funding sources are diminished through economic shifts and e-commerce tax avoidance, forcing school officials to rely on multiple sources of revenue (Davies & Hentschke, 2002). The net result of these changes in school accountability and funding is the need for school business leaders that have stronger entrepreneurial skills.
In reference to entrepreneurial characteristics, Kourilsky and Hentschke (2003) identify “…the following attributes: recognizing and acting on opportunities, marshaling resources and adding value, taking risk, articulating a compelling vision, initiating ventures, and modifying strategic and tactical plans on a regular basis to adapt to changing circumstance” (p.117). With these characteristics in mind, and 21st century schools as agents of change, it is fitting to see an emphasis of entrepreneurial leadership in the field of K-12 education.

Procurement and allocation of resources is more than just a school official’s issue as accountability in K-12 education continues to rise. Federal and state governments have a critical duty to future generations, and hence, the well-being of our nation. For too many years, government entities have forced regulations on schools without providing the necessary funding to effectively meet these new guidelines. These mandates, for the most part, are necessary and have increased the educational quality for some students; but one must ask, “At what expense?” The result in some schools and districts has been an inequitable distribution of resources as funds are transferred from existing programs to new programs designed to meet state and federal guidelines. This has put a financial strain on schools and districts that are already struggling to meet the changing educational needs of students for the 21st century.

Summary

School officials are becoming more efficient with resources as they develop accountability systems that will identify those practices that are effective, as well as those that are too costly. The NCLB act has created accountability in student performance and this accountability has transferred to the use of school resources that impact student achievement. School officials are required to make difficult decisions and make honest assessments of how well programs and resources are funding student achievement.
In light of these and other studies in the last decade, the question was raised as to whether an increase in per-pupil expenditures for school districts will have a measurable impact on student achievement. If the first question is affirmed, then the resulting questions surround equity in distribution of state funds and adequacy of those funds as outlined in the study of Texas school districts by Reschovsky and Imazeki (2003). In their study, they found a dramatic variance in state funding across Texas at the district level and called for state funding formulas that address cost variance due to differing educational needs. Recent litigation at the state level has assisted states in making the transition to more equitable funding, yet there are issues that remain at the district distribution and program evaluation level that need further study.

With limited revenues and the increasing need for intervention programs to educate all students, more research is needed to assess what resources can have the greatest impact on student achievement. This study examined per-pupil expenditures of Missouri school districts compared to measures of student achievement (attendance, MAP scores, and graduation rates). As school resources become scarcer relative to educational program needs for all students, it will take a joint venture between school officials and government entities to ensure an equitable education for all students, develop or access new funding resources, and maximize the effective use of resources that have been allocated. Government entities will need to step forward and fund more of the cost for past and future mandates. In turn, school business officials will need to become more entrepreneurial as they continue the trend of securing non-traditional funding sources, take more calculated risks in the pursuit of high returns, and hold themselves and others accountable for results based on resource allocation.
CHAPTER 3
METHODOLOGY

Introduction

The purpose of this study was to analyze the relationship of school district per-pupil expenditures (PPE) to student achievement outcomes. By looking at expenditure inputs across Missouri school districts, several output measures of district success and student achievement were analyzed. The study looked at district MAP scores, attendance rates and graduation rates, as these are key indicators in measuring a school district’s success with respect to Missouri’s Annual Performance Report (APR).

This study used Core Data collected annually by the Missouri Department of Elementary and Secondary Education (MoDESE) with respect to school districts and their student data. This study also used Annual Secretary to the Board Report (ASBR) information sent to MoDESE by August 15th of 2010 and 2011 that contains revenue and expenditure information for the school districts from the previous fiscal year. This becomes public information once the report has been approved by MoDESE. Finally, this study used MAP data as reported by MoDESE in each school district’s annual report card (Annual Performance Report).

Research Questions and Hypotheses

Three research questions were designed to explore the relationship between per-pupil expenditure (PPE) and achievement outcomes over two years. Achievement outcomes, which included Missouri Assessment Program (MAP) scores, attendance rates, and graduation rates, were used as the criterion variables. The research questions addressed in this study were:
RQ1: What is the relationship between per-pupil expenditure and attendance rates and is the relationship moderated by school year (2010 or 2011)?

$H_{1\text{Null}}$: There is no relationship between per-pupil expenditure and attendance rates in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

$H_{1\text{Alternative}}$: There is a relationship between per-pupil expenditure and attendance rates in Missouri school districts and the relationship is moderated by school year (2010 or 2011).

RQ2: What is the relationship between per-pupil expenditure and graduation rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

$H_{2\text{Null}}$: There is no relationship between per-pupil expenditure and graduation rates in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

$H_{2\text{Alternative}}$: There is a relationship between per-pupil expenditure and graduation rates in Missouri school districts and the relationship is moderated by school year (2010 or 2011).

RQ3: What is the relationship between per-pupil expenditure and MAP scores in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

$H_{3\text{Null}}$: There is no relationship between per-pupil expenditure and MAP scores in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

$H_{3\text{Alternative}}$: There is a relationship between per-pupil expenditure and MAP scores in Missouri school districts and the relationship is moderated by school year (2010 or 2011).

A review of the three hypotheses and related methodological components including predictor variable, criterion variable, moderator, and statistical technique used to test each question, were displayed in Table 3.1. These components are briefly presented here and discussed in more detail later in the chapter. For all three hypotheses, a moderated multiple regression was run to assess whether relationships existed between predictor and criterion.
variables, and if there is an interaction between the predictor variable and moderator on the criterion variables.

Table 3.1

*Hypotheses with Related Methodological Components*

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Predictor Variable</th>
<th>Criterion Variable</th>
<th>Moderator</th>
<th>Statistical Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Per-pupil Expenditures (PPE)</td>
<td>Attendance Rates</td>
<td></td>
<td>Moderated Multiple Regression</td>
</tr>
<tr>
<td>H2</td>
<td>Per-pupil Expenditures (PPE)</td>
<td>Graduation Rates</td>
<td>School Year (2010 or 2011)</td>
<td>Moderated Multiple Regression</td>
</tr>
<tr>
<td>H3</td>
<td></td>
<td>MAP Scores</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Theoretical Model**

Through the use of archival data, an examination of the achievement outcomes and PPE in the school years of 2010 and 2011 was conducted. A predictor variable, criterion variables, and a moderating variable were specified in the model. The criterion variables were attendance rates, MAP scores, and graduation rates. The predictor variable was PPE and the moderating variable was school year (2010 or 2011).
Research Design

This study employed a quantitative, correlation research approach. Correlation research studies are used to measure the direction and magnitude of a relationship among variables (Gall et al., 2007). The three possible outcomes of a correlation study are a positive correlation, a negative correlation, and no correlation. Correlational studies only suggest a relationship between variables exists. This means that the technique cannot prove that one variable causes another variable to change (Creswell, 2008). Quantitative designs are used to support theory and are considered to be a deductive reasoning technique while qualitative studies are inductive by nature. Deductive reasoning arrives at a specific conclusion based on generalizations while inductive reasoning takes events and makes generalizations (Sternberg, 2009). Given that the
hypothesis was generated from theory, a deductive or quantitative approach was appropriate for this study.

Population, Sample, and Sampling Methodology

Population. The population consisted of public school districts in the Midwestern state of Missouri. There were 522 school districts in the state of Missouri that met this criterion. To be included in the population, school districts must have only included public schools. Further, only school districts with an average daily attendance per grade-level of at least 40 were included in the study. Demographic characteristic and social characteristics were not a condition of inclusion in this study.

Sample. Using Core Data that are submitted annually by 522 public school districts in the state of Missouri to MoDESE, this study included 267 public school districts in the state that had an average daily attendance per grade-level of at least 40 in 2011, graduation and attendance rates greater than zero in 2010 to 2011, MAP mean scores in 3rd through 8th grade communication arts and math for 2010 and 2011, MAP mean scores in 5th and 8th grade science for 2010 and 2011, and MAP End-of-Course mean scores in English 2, Algebra 1, Biology 1, and Government for 2010 and 2011. The study used core data from school years 2009-10 and 2010-11 to analyze the influence of cuts in per-pupil expenditures (PPE) on school district achievement. The study used district MAP assessment scores and additional APR data as these could be impacted by the change in PPE. The MAP assessment data included the sum of school district’s mean scores on those assessments administered (composite scores) in both school years by all districts in the study. The additional APR data studied included the district’s annual graduation rate and attendance rate. The study then examined relationships between PPE and achievement outcomes, which included attendance rates, graduation rates, and MAP scores.
**Sampling methodology.** The purposeful or judgmental technique of criterion sampling was used to obtain the sample from the population. Purposeful sample is a non-random sample where the researcher uses an array of methods to gather all possible cases of a highly specified or hard to reach population (Neuman, 2003). A criterion sampling technique entails the selection of cases that meet important conditions (Gall et al., 2007). There are several different types of purposeful sampling that include typical, random purposeful, maximum variation, criterion, convenience, snowball or chain, and opportunistic. Criterion sampling is effective in education research when studying groups with common characteristics. In this type of sampling technique, the criteria used reflect the purpose of the study and often leads to information-rich cases (Merriam, 1998). Purposeful or judgmental sampling is often used in exploratory or field research and is acceptable when cases are selected with a specific purpose in mind (Neuman, 2003).

**Power Analysis**

Three statistical parameters were set before performing a power analysis to confirm adequacy of sample size. These parameters included power, expected effect size, and critical alpha. Power is defined as the probability of correctly rejecting the null hypothesis when it is false (Keith, 2006). In social science research, power is normally set at 80%. This means that there is an 80% probability that, given the size of the sample collected, a significant difference will be found.

The effect size is referred to as a statistical measure of the strength of an observed difference between groups. In this study, it was specifically the change in slope between the slopes of two regression lines, \( \Delta \) slope. A medium expected effect size is adopted, i.e., .025, for this particular study. The probability that a significant finding occurred by random chance is
defined as the critical alpha. Critical alpha is typically set at .05 for social science research studies. This indicates a 5% random chance that the null hypothesis will be rejected when in fact it is true. Using these parameters a formal power analysis was conducted: (a) Power = .80, (b) Effect size = .025, and (c) alpha = .05. Thus for H1, H2, and H3, using G*Power 3.0.10 (a sample size power analysis program), a minimum of 246 school districts were needed to produce an 80% probability of rejecting the null hypothesis (Faul, Erdfelder, Lang, & Buchner, 2007) (Appendix A).

Data Collection

Data were collected using the Missouri Department of Elementary and Secondary Education Comprehensive Data System Portal (MCDS) and linked by county and district number to include all the variables for this study. Since the MCDS is open to the public, permission to access the data was not necessary. The researcher downloaded data to a Microsoft Excel spreadsheet, randomly numbered the districts, and identified those districts that met the sample criterion. Statistical Package for the Social Sciences (SPSS) software program was then used to analyze the data.

Operationalization of Variables

Five variables were specified in the theoretical model including one predictor variable, three criterion variables, and one moderating variable. The criterion variables were attendance rates, graduation rates, and MAP scores. The predictor variable was per-pupil expenditures (PPE) as reported in MoDESE core data while the moderating variable was school year (2010, 2011).

Per-pupil Expenditures (PPE). PPE was operationalized as the current district operating expenditures per average daily attendance as calculated by the Annual Secretary to the Board
Report (ASBR) and reported on MoDESE Core Data. Expenditures do not include capital project outlay and is corrected for offsetting revenues in student activities and food service as well as tuition and fee revenues from other school districts. PPE was measured at the ratio level. This variable was collected via archival sources.

**Missouri Assessment Program Scores (MAP).** MAP scores were operationalized as the sum of mean results from the annual exams administered to public schools in the spring. Exams included third, fourth, fifth, sixth, seventh, and eighth grade for mathematics and communication arts, fifth and eighth grade science, and End of Course (EOC) exams at the completion of English 2, Algebra 1, Biology 1, and Government. MAP scores were measured at the interval level and were collected via the MCSD archival data system.

**Attendance Rate.** Attendance rate was defined as the ratio of attendance hours to the number of attendance and absence hours for a public school district K-12 submitted by districts to MoDESE. MoDESE uses MSIP/NCLB (Missouri School Improvement Program/No Child Left Behind Act) attendance data reported by school districts/LEAs via MOSIS (Missouri School Information System) and aggregated on Screen 14 of the Core Data Collection System to calculate attendance rates. The hours of absence method of calculating attendance was used. The mathematical calculation used was:

\[ \frac{\text{MSIP/NCLB Total Hours of Attendance}}{\text{MSIP/NCLB Total Hours of Attendance} + \text{MSIP/NCLB Total Hours of Absence}} \times 100 \]

Attendance rate was measured at the ratio level. This variable was collected via the MCSD archival data system.

**Graduation Rate.** Graduation rate was defined as the ratio of number of graduates to their prior four-year cohort including dropouts reported by districts to MoDESE. MoDESE uses
graduate and dropout data reported by school districts/LEAs via MOSIS and aggregated on Screen 13 of the Core Data Collection System to calculate persistence to graduation rates. Calculation to acquire graduation rate was:

\[
\frac{\text{Graduates}}{\text{Graduates} + \text{Cohort Dropouts}} \times 100
\]

Graduation rate was measured at the ratio level and was collected via the MCSD archival data system.

**School Years (2010, 2011).** Years 2010 and 2011 data were a reflection of school district activity during those fiscal years. A school district fiscal year in Missouri is from July 1\textsuperscript{st} to June 30\textsuperscript{th}. Year 2010 included data from July 1\textsuperscript{st}, 2009, to June 30\textsuperscript{th}, 2010, and year 2011 included data from July 1\textsuperscript{st}, 2010, to June 30\textsuperscript{th}, 2011. These years of data were selected for the study due to the potential impact of the national recession on Missouri school district revenues during that time period. The school years were measured at the nominal level. This variable was collected via the MCSD archival data system.

**Instrumentation**

The data for this study were archival data on the Missouri Department of Elementary and Secondary Education Comprehensive Data System Portal (MCDS) website. This data center was created in 2011 to house archival MoDESE data in a searchable format for school district and public access. The department continues to develop the system and add data as they become available. The MCDS system is structured to ensure that data with groups of 10 or less are masked from public view in accordance with federal law. Per-pupil expenditures (PPE) have been calculated within the ASBR of Missouri school districts since 2001. The calculation pulls Average Daily Attendance (ADA) information from attendance and absence hours submitted by school district at the conclusion of the fiscal year. These attendance data are also used by the
department to calculate district attendance rates. School district attendance rates are calculated by the ratio of hours in attendance to the total attendance hours possible (hours of attendance and hours of absence). In September 2006, attendance data were linked to the departments MOSIS system that tracks the attendance of each student in the state. Final attendance data for ADA reports and attendance rate calculations continue to be submitted by school districts in June Core Data cycle and then linked to students through the Missouri Student Information System (MOSIS). The ADA data are then used with the district submittal of the ASBR by August 15th annually to calculate PPE.

School district graduation rate data are available on the MoDESE MCDS system dating back to 2002. Calculations up to 2012 have been done using Core Data number of graduate and dropouts submitted to MoDESE by school districts in June Core Data cycle. In 2006, MoDESE also began integrating these data with the MoDESE MOSIS system for specific student characteristics. Through 2012, the graduation rate was calculated using number of graduates to the number of graduates and their 9-12 cohort dropouts. Future graduation rates will be calculated for both four year and five year graduates.

Missouri Assessment Program exam scores are collected each spring as public school students in grades three through twelve take math, communication arts, science, and/or end of course exams. The mean scores in a school district are transformed into index scores for each exam and used as a performance indicator for their Annual Performance Report (AYP) and APR. In 1997, MoDESE began administering the MAP tests to measure student progress on the Missouri Performance Standards required by the Outstanding Schools Act of 1993. The assessments have traditionally included multiple choice, constructed response, writing prompts, and performance event. In 2008, MoDESE began replacing secondary assessments with End of
Course (EOC) exams administered to student upon completion of courses such as English 1, English 2, Algebra 1, Algebra 2, Geometry, Biology 1, American History, and Government. In 2011, due to financial constraints, writing prompts and performance events were removed from MAP assessments. The 2011 Addendum to the 2010 Technical Report on the MAP found that removal of performance events did not substantively affect MAP test results (CTB McGraw-Hill, 2011).

Validity

**Internal validity.** Internal validity is the degree to which the researcher is able to control extraneous variables so the observed results can be attributed to the treatment variable. It assumes the design is suitable for the study, the sample is characteristic of the population, sample methodology contains no biases, and the statistical technique is appropriate for what is being analyzed, thereby assessing how assertively one can assume that the observed effect(s) were a product of the predictor variable (PPE). The data collections were appropriate and the instruments used were expected to accurately measure what was supposed to be measured.

CTB/McGraw-Hill LLC, developer and publisher of the MAP assessments has done several analyses for validity and reliability to ensure that the test measures student’s progress with respect to the Missouri learning outcomes and that the tests are consistent over time. The 2011 Addendum to the 2010 Technical Report CTB/McGraw-Hill found that overall, MAP assessments including each grade/content areas were found to be reliable where internal consistency of items yielded Cronbach’s alpha coefficients above 0.90.

**External validity.** External validity is the extent to which the results of a research study can be generalized to individuals or groups and situations beyond the study participants (Gall et al., 2007). Creswell (2008) asserted that external validity means that the individual’s scores from
an instrument makes sense, are meaningful, and enables the researcher to draw good conclusions from the sample being studied. Furthermore, the sample was an appropriate representation of the population. In this research study, specific attention was paid to the sampling technique, data analysis, and population selection.

**Ethical Considerations**

While it may be appropriate to apply the results of this study to the population, it may not be a correct assumption of public school districts in other parts of the United States. School districts vary from state to state across the nation, in number per state, and their methods of measuring student data. An additional ethical concern was preventing school district identification in the study. To address this risk, the researcher coded each school district numerically in order to prevent identification. A final ethical consideration was the lack of disaggregation of the data by school, student, or teacher characteristics. Any conclusions specific to those demographics, within district, or within school trends would be an inappropriate interpretation of the data.

**Limitations**

There may have been unknown variables in the study that have impacted school district results and therefore influence scores in the study. The researcher may not have been aware of these variables at the time of the study. For example, the choice of test, timing, and adjustments for students with special needs, students with disabilities, transient students, or students with limited proficiency in English can impact test results (Koretz, 2002). The researcher may not have had access to such information in the particular study.

This study only examined data across the state of Missouri at the school district level and did not consider within district or within school disparities. Hanushek and Rivkin (2010a)
maintain that the majority of teacher quality variation measured using value added is within schools. This study was limited in that it did not control for student demographics such as gender, race, socioeconomic status, disability, level of English language proficiency, or school demographics such as teacher qualifications. Disparity in teacher qualifications related to school percentage of impoverished students and students of color is well documented (Haycock, Lankford & Olson, 2004; Haycock & Hanushek, 2010; Haycock & Richardson, 2011; Peske & Haycock, 2006). However, by design, this research study was not intended to investigate teacher quality.

An additional limitation to this study was the state of Missouri’s school districts testing window. Public school districts in Missouri have a four week window to administer these tests. This can give some school districts an advantage if they administer tests during the third or fourth week. In the spring of 2010, the testing window was extended by one week for seventy school districts due to inclement weather. Theoretically, this could result in those students having better preparation for assessment. There are also school districts that have a high percentage of students with special needs that are given these state assessments without getting special considerations. This could potentially have a negative impact on a school district’s mean score on an assessment.

The study was also limited in that not all school districts have the same number of attendance days. State statues in Missouri require that public school districts have 174 days of attendance or 1,044 hours of attendance in their school year calendar (Missouri Revised Statutes, 2011a). However, school districts may have less attendance days or hours from year to year due to weather conditions beyond their control. By statute, Missouri school districts are only required to make up a total of 10 days due to cancellation related to inclement weather (Missouri Revised
Statutes, 2011b). In school year 2010-11, several Missouri School Districts were in session less than 174 school days due to an unusually harsh winter.

**Statistical Analysis**

The researcher used a moderated multiple regression analysis to test all three research questions. Multiple regression examines the relationship between multiple criterion variables and predictor variables. Predictor variables precede criterion variables. Multiple regression is thought to be a more sophisticated approach of analysis when compared to bivariate correlation (Keith, 2006). The aim of regression is to determine if a relationship exists between variables and whether a particular variable can predict an outcome. The criterion variable for H1 was attendance rates, graduation rates for H2, and MAP scores for H3. The predictor variable for all three hypotheses was per-pupil expenditures (PPE). Each regression model contained a criterion variable, predictor variable, and a moderator.

The moderation variable for H1-H3 was school year (2010 or 2011), which was defined as data collected and calculated from July 1st, 2009, to June 30th, 2010, for fiscal year 2010 and from July 1st, 2010, to June 30th, 2011, for fiscal year 2011. A moderation variable assesses whether there is an interaction between the predictor and moderator on the criterion variable (Keith, 2006). Thus, the tests were used to determine if school year (2010 or 2011) affects the relationship between per-pupil expenditure and academic outcomes, including (a) attendance rates, (b) graduation rates, and (c) MAP scores.

Results are presented in three discrete sections in Chapter Four. These sections include the demographics, detail of analyses, and summary of results. The demographic section includes a profile of school districts. The detail of analysis section includes a complete breakdown of the analyses conducted by hypothesis, including evaluation of appropriate assumptions and final
inferential results. The summary of results section includes a recap of the study, study design, results by hypothesis, and what the reader will find in Chapter Five. The data analysis includes descriptive statistics, including mean, standard deviation, and frequency where applicable. In addition, z-scores are presented to support assumptions of normality where relevant. Further, a regression table and supporting figures are displayed provided a relationship or effect was found. For this analysis, alpha was set at $p = .05$ provided assumptions of normality were met. When these assumptions were violated, the researcher determined the appropriate next steps.

**Parametric assumptions.** Assumptions of normality, linearity, and homoscedasticity were evaluated to detect any violation of parametric assumptions. Z-scores for skewness and kurtosis were calculated to detect non-normality. In cases where a distribution was found to be non-normal, variable transformation was attempted to improve distribution parameters.

**Summary**

This quantitative study was designed to explore the possible difference between PPE and achievement outcomes over two school years in the state of Missouri. This chapter described the research methodology that was used to accomplish this purpose. Also described in this chapter were the sample, data collection procedures, and data analysis. Finally, ethical considerations were addressed to ensure confidentiality and protection of participants. Chapter Four will include a description of the data collected, the data analysis procedures, and the results of the study as they pertained to the hypotheses and research questions. Discussed in Chapter Five is an overview of this study, summary of findings, conclusions and implications, recommendations for further study, and recommendations for practice.
CHAPTER 4
ANALYSIS OF DATA AND FINDINGS

Introduction

The purpose of this study was to examine the relationship of school district per-pupil expenditures (PPE) to achievement results. In considering expenditure inputs across school districts in the state of Missouri, this study analyzed a number of output measures of student achievement and district success. The study focused on district MAP scores, attendance rates, and graduation rates, as the Missouri’s Annual Performance Report (APR) uses these key indicators in measuring a school district’s success.

This study used school district expenditure information submitted by districts to the Missouri Department of Elementary and Secondary Education (MoDESE) in the fall of 2010 and 2011 on their ASBR (Annual Secretary to the Board Report). The study also used school district’s Core Data collected annually by MoDESE which contains district and student data. Finally, MAP data for this study were collected from MoDESE as they are reported in school district’s annual report card (Annual Performance Report). All data used in this study were public information available on MoDESE’s Education Comprehensive Data System Portal (MCDS).

Data Collection

The data for this study were collected from the public Missouri Department of Elementary and Secondary Education Comprehensive Data System Portal (MCDS). These data were pulled from four different MoDESE excel documents; MAP scores by district, attendance rates by district, graduation rates by district, and expenditures per pupil by district for 2010 and
The 2010 and 2011 data were combined into a single spreadsheet linked by district and county codes for each school district. Districts with less than 40 average daily attendance per grade-level, missing MAP mean test scores for students in 3rd through 8th grade communication arts and math, 5th and 8th grade science, or missing End-of-Course mean scores in English 2, Algebra 1, Biology 1, and Government were removed from the spreadsheets, as well as any district with a graduation or attendance rate of zero for 2010 or 2011.

The resulting spreadsheets were combined into a single spreadsheet linked by district and county codes for each school district. District and county codes were then replaced with random numbers 1 to 267 to form the final spreadsheet with all the comprehensive data necessary for input into the Statistical Package for the Social Sciences (SPSS). The final data were then input into the SPSS software program to analyze the data.

Demographics

This study examined data from 267 public school districts in the state of Missouri that had an average daily attendance of 40 or more per grade-level in 2011 as well as 2010 and 2011 attendance rates and graduation rates greater than zero. The school districts also reported MAP mean test scores for students both years in 3rd through 8th grade communication arts and math, 5th and 8th grade science, and End-of-Course mean scores in English 2, Algebra 1, Biology 1, and Government. These 267 school districts were K-12 districts dispersed across the entire state of Missouri.

Table 4.1 shows that the 267 districts in this study had a range of enrollments from 559 to 23,543 with an average enrollment of 2,996 students. Their average breakdown for sources of revenue was 15.65% Federal, 35.46% State and 48.9% Local funds. Their percentage of Federal revenue was nearly double the historical rate of 7% to 8% (Grubb, 2009; Hanushek, 2003) due to
America Recovery and Reinvestment Act funds distributed over the two years of this study. Local revenue is derived through a tax levy on Assessed Valuation. The districts studied had an average assessed valuation of $274,593,638 from which to levy tax revenues and an average operating reserve (fund balance) of $5.6 million.

The average teacher salary of the districts in this study was $42,272 with a range across districts from $32,826 to $68,367. These districts had student to classroom teacher ratios from 11 to 44 with an average of 33 students per classroom teacher. Free and Reduced Lunch (F&RL) percentages are used as a measure of socioeconomic status in the state of Missouri. Districts in this study had a range of F&RL percentages from 10.8% to 93.7% with an average of 50.86%.

Table 4.1

<table>
<thead>
<tr>
<th>Enrollment</th>
<th>Funding</th>
<th>12-31-2010</th>
<th>F&amp;R L %</th>
<th>Fund Balance</th>
<th>Students per Classroom Teacher</th>
<th>Average Teacher Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>559.0</td>
<td>1.1</td>
<td>2.3</td>
<td>7.4</td>
<td>0</td>
<td>-61198949.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>24102.0</td>
<td>49.7</td>
<td>77.4</td>
<td>95.7</td>
<td>4415370500</td>
<td>118744101.00</td>
</tr>
<tr>
<td>Range</td>
<td>23543.0</td>
<td>48.6</td>
<td>75.1</td>
<td>88.3</td>
<td>4415370500</td>
<td>179943050.00</td>
</tr>
<tr>
<td>Average</td>
<td>2996.20</td>
<td>15.65</td>
<td>35.46</td>
<td>48.90</td>
<td>274593637</td>
<td>5637153.97</td>
</tr>
</tbody>
</table>

Data Analysis

Three moderated linear regressions were conducted in testing hypotheses 1, 2, and 3 to assess the research questions. Table 4.2 shows the variables, moderator, and statistical analysis used in the study. The predictor variable for all three analyses was per-pupil expenditure (PPE). The criterion variables for H1, H2, and H3 are attendance rates, graduation rates, and Missouri
Assessment Program (MAP) scores, respectively. Alpha level was set at .05, such that a significant relationship was identified if \( p < .05 \). While data were collected from 267 school districts, these were collected across two years, resulting in 534 cases of data. The three research questions examined in this study were:

RQ1: What is the relationship between per-pupil expenditure (PPE) and attendance rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

RQ2: What is the relationship between per-pupil expenditure and graduation rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

RQ3: What is the relationship between per-pupil expenditure and MAP scores in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

Table 4.2

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Predictor Variable</th>
<th>Criterion Variable</th>
<th>Moderator</th>
<th>Statistical Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Per-pupil Expenditures (PPE)</td>
<td>Attendance Rates</td>
<td>School Year (2010 or 2011)</td>
<td>Moderated Multiple Regression</td>
</tr>
<tr>
<td>H2</td>
<td>Per-pupil Expenditures (PPE)</td>
<td>Graduation Rates</td>
<td>School Year (2010 or 2011)</td>
<td>Moderated Multiple Regression</td>
</tr>
<tr>
<td>H3</td>
<td></td>
<td>MAP Scores</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prior to testing the hypotheses, data cleaning was undertaken to assess for outliers and missing data. Additionally, tests of the assumptions of regression were conducted, including evaluation of normality, linearity, and homoscedasticity. Moderating effects were determined by entering the interaction term between PPE and year in step two of the regression, after PPE and
year were individually included in step one of the model. Results for this study are presented in the following sections of this chapter according to each hypothesis.

**Hypothesis 1**

**H1:** There is no relationship between per-pupil expenditure and attendance rates in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

**H1 Alternative:** There is a relationship between per-pupil expenditure and attendance rates in Missouri school districts and the relationship is moderated by school year (2010 or 2011).

Moderated multiple regression analysis was used to test hypothesis 1; that is, to determine if a relationship exists between PPE and attendance rates, and whether the relationship was moderated by year. PPE was measured at the ratio level, and represents the district operating expenditures per average daily attendance. Attendance rates were measured at the ratio level and are defined as the ratio of attendance hours to the number of attendance and absence hours for a public school district.

**Data cleaning.** Prior to the analysis of H1, data were screened for missing data and univariate outliers. Given that an inclusion criteria for selection into the sample was that each district have scores for PPE and attendance rate across both years, no missing data were identified among cases. Data were evaluated for univariate outliers by transforming raw scores to z-scores and evaluating z-scores against a critical value of $+$/−3.29, $p < .001$ (Tabachnick & Fidell, 2007). A z-score with a magnitude higher than 3.29 represents a score that is more than three standard deviations away from the mean, and thus represents an outlier. PPE and attendance rate distributions were evaluated, and two positive outliers were identified among PPE and nine negative outliers from five districts were identified among attendance rate. These cases were found and removed from the data set. Thus, for H1, 534 cases of data were collected,
and 523 were included in the analysis. Descriptive statistics for continuously scaled predictor (PPE) and criterion (attendance rate) variables are displayed in Table 4.3.

Table 4.3

*Descriptive statistics of Predictor and Criterion Variables for Hypothesis 1*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>523</td>
<td>6055.78</td>
<td>18065.88</td>
<td>8521.88</td>
<td>1686.96</td>
<td>2.389</td>
<td>7.840</td>
</tr>
<tr>
<td>Attendance Rate</td>
<td>523</td>
<td>92.00</td>
<td>97.30</td>
<td>94.63</td>
<td>0.745</td>
<td>-0.129</td>
<td>0.668</td>
</tr>
</tbody>
</table>

Tests of normality. The parametric assumption of normality was assessed for both the predictor (PPE) and criterion (attendance rate) variables. To statistically evaluate for departures from normality, z-skew and z-kurtosis scores were evaluated. Z-skew coefficients are used for evaluating whether a distribution is significantly skewed; that is, whether the distribution pulled to the left or the right of the mean. Z-kurtosis coefficients are used to evaluate whether a distribution is significantly kurtotic; that is, whether the distribution is overly peaked or plateaued. Z-skew coefficients were calculated by dividing the skew coefficients by the skew standard error. Z-kurtosis coefficients were calculated similarly, by dividing kurtosis coefficients by the kurtosis standard error. Resulting z-skew and z-kurtosis values are presented in Table 4.4.
Table 4.4

**Skewness and Kurtosis of Hypothesis 1 Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness</th>
<th>Skew Std. Error</th>
<th>z-skew</th>
<th>Kurtosis</th>
<th>Kurtosis Std. Error</th>
<th>z-kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>2.389</td>
<td>.107</td>
<td>22.367</td>
<td>7.840</td>
<td>.213</td>
<td>36.771</td>
</tr>
<tr>
<td>Attendance Rate</td>
<td>-0.129</td>
<td>.107</td>
<td>-1.207</td>
<td>0.668</td>
<td>.213</td>
<td>3.133</td>
</tr>
</tbody>
</table>

Z-skew and z-kurtosis coefficients were compared against a critical value of +/-3.29 ($p < .001$) in a technique recommended by Tabachnick and Fidell (2007) to identify non-normality. The resulting z-skew and z-kurtosis scores indicate that PPE was both significantly positively skewed and significantly leptokurtic (positively kurtotic), while attendance rate was neither significantly skewed nor kurtotic. As such, normality was assumed for attendance rate, but not for PPE. As the normality assumption was violated for the PPE distribution, PPE data were transformed using a logarithmic (LG10) transformation. Histograms depicting raw and transformed PPE data are presented in Appendix B. Transformed PPE scores were entered into each of the three analyses.

**Linearity.** Linearity was evaluated by reviewing the Normal P-P plot constructed using the residuals from the predictor and criterion variables. A linear relationship between the predictor and criterion variables was indicated in the residual plot (Figure 4.1). Thus, linearity was assumed.
Homoscedasticity. Homoscedasticity is defined as an equal amount of variance across predicted criterion variable scores and all predicted scores (Pallant, 2007). Homoscedasticity was evaluated through examination of the standardized residual plot. According to Tabachnick and Fidell (2007), adequate homoscedasticity is indicated by an even and centralized distribution of standardized residuals. As can be seen in Figure 4.2, heteroscedasticity is evident in the standardized residual plot, given that many cases fall below the desired centralized rectangular shape.

Figure 4.1. Residual plot for evaluation of linearity for hypothesis 1
Results of Hypothesis 1. Using SPSS 20, a moderated linear regression was conducted to test whether a relationship existed between transformed PPE and attendance rate, and whether that relationship was moderated by year. The predictor (transformed PPE) and moderator (year) were entered in block one of the model, and the interaction term (transformed PPE × year) was entered in block two. If year moderated the effect of PPE, this would be indicated by the presence of a significant interaction term. Results from the omnibus model were highly significant, $F(2, 520) = 13.538, p < .001$. This means that the probability of obtaining an F value
of 13.538 is less than .001. Since the model used considers a probability < .05 to be significant, that is less than a 5% chance the null hypothesis is rejected by error, the results indicate a significant relationship between the variables. These results represent how well the variability was predicted by both transformed PPE and year as a collective; however, as year was included as a moderator variable, importance was placed on the unique contribution of PPE to attendance rates. Transformed PPE made a significant, unique, slightly negative contribution toward predicting attendance rates, $\beta = -0.168, p < .001$. This means that as per-pupil expenditures increased by one standard deviation, attendance rates decreased by 0.168 standard deviation, or only about a sixth of a standard deviation. Though this is a significant finding, it is important to remember this included only two years of data and the low side of the range is still a 92% attendance rate. The relationship between PPE and attendance, however, was not moderated by year, $\Delta R^2 < .001, F(1, 519) = 0.252, p = .616$. That is, per-pupil expenditures did significantly predict attendance rates, but the relationship was not moderated by year. As such, the null hypothesis was partially rejected. Please see Table 4.5 for detailed results of the analysis. A graphical representation of the relationship between raw PPE scores and attendances rates is presented in Figure 4.3.
### Table 4.5

**Summary of Coefficients for Moderated Multiple Linear Regression between Transformed PPE and Attendance Rates, as Moderated by Year**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-Squared</th>
<th>Std. Error</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.222</td>
<td>.049</td>
<td>0.728</td>
<td>13.538</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>2</td>
<td>.224</td>
<td>.050</td>
<td>0.728</td>
<td>0.252</td>
<td>.616</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
</tr>
<tr>
<td>Log10_PPE</td>
<td>-1.694</td>
</tr>
<tr>
<td>Year</td>
<td>0.218</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
</tr>
<tr>
<td>Log10_PPE</td>
<td>-1.034</td>
</tr>
<tr>
<td>Year</td>
<td>1.916</td>
</tr>
<tr>
<td>Log10_PPE×Year</td>
<td>-0.433</td>
</tr>
</tbody>
</table>

Note. Dependent Variable: Attendance rate
Hypothesis 2

H2_Null: There is no relationship between per-pupil expenditure and graduation rates in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

H2_Alternative: There is a relationship between per-pupil expenditure and graduation rates in Missouri school districts and the relationship is moderated by school year (2010 or 2011).

Hypothesis 2 was tested using moderated multiple regression to determine if a relationship exists between PPE and graduation rates, and whether the relationship is moderated by year. PPE was
measured as indicated in the analysis of hypothesis 1. Graduation rates were measured at ratio level and are defined as the ratio of number of graduates to their prior four-year cohort including dropouts.

**Data cleaning.** Similarly to in the analysis of H1, data were screened for missing data and univariate outliers prior to testing H2. Once again, no cases with missing data were identified. Data were evaluated for univariate outliers in the same manner as was done in the analysis for H1. Raw scores for PPE and graduation rates were transformed to z-scores and z-scores with a magnitude higher than 3.29 were classed as outliers and removed from the data set. Two positive outliers were identified among PPE and nine negative outliers from five different school districts were identified among graduation rate. Thus, for H2, 534 cases of data were collected, and 523 were included in the analysis. Descriptive statistics for continuously scaled predictor (PPE) and criterion (graduation rate) variables are displayed in Table 4.6.

Table 4.6

*Descriptive statistics of Predictor and Criterion Variables for Hypothesis 2*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>523</td>
<td>6055.78</td>
<td>18065.88</td>
<td>8506.49</td>
<td>1635.525</td>
<td>2.311</td>
<td>7.690</td>
</tr>
<tr>
<td>Graduation Rate</td>
<td>523</td>
<td>69.4</td>
<td>100.0</td>
<td>89.1</td>
<td>5.338</td>
<td>-0.469</td>
<td>0.401</td>
</tr>
</tbody>
</table>

**Tests of normality.** The parametric assumption of normality was assessed for both the predictor (PPE) and criterion (graduation rate) variables in the same manner as was conducted for the analysis of H1. Z-skew and z-kurtosis values are presented in Table 4.7. As PPE was once
again found to be significantly positively skewed and significantly leptokurtic (positively kurtotic), transformed (Log10 PPE) scores were used in the analysis of H2. Additionally, graduation rates were significantly negatively skewed. However, analyses were conducted with both transformed (square root) data and untransformed data showed no significant improvement in findings. That is, while the effect of PPE was improved using transformed data, it did not improve the analysis to beyond significance. As such, untransformed data were used in the analyses in order to aid interpretation of findings.

Table 4.7

Skewness and Kurtosis of Hypothesis 2 Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness</th>
<th>Skew Std. Error</th>
<th>z-skew</th>
<th>Kurtosis</th>
<th>Kurtosis Std. Error</th>
<th>z-kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>2.311</td>
<td>.107</td>
<td>21.640</td>
<td>7.8690</td>
<td>.213</td>
<td>36.069</td>
</tr>
<tr>
<td>Graduation Rate</td>
<td>-0.469</td>
<td>.107</td>
<td>-4.392</td>
<td>0.401</td>
<td>.213</td>
<td>1.883</td>
</tr>
</tbody>
</table>

**Linearity.** Linearity between the predictor and criterion variables was evaluated by reviewing the Normal P-P plot constructed using the residuals. The plot showed no significant evidence of non-linearity (Figure 4.4). Therefore, a linear relationship between transformed PPE and graduation rates was assumed.
Homoscedasticity. Homoscedasticity, or an equal amount of variance across predicted criterion variable scores and all predicted scores (Pallant, 2007), was evaluated through examination of the standardized residual plot. An even and centralized distribution of standardized residuals indicates adequate homoscedasticity (Tabachnick & Fidell, 2007). As can be seen in Figure 4.5, heteroscedasticity is evident in the standardized residual plot, given that many cases fall outside of the desired centralized rectangular shape.

*Figure 4.4. Residual plot for evaluation of linearity for hypothesis 2*
Results of Hypothesis 2. Using SPSS 20, a moderated linear regression was conducted to test whether a relationship existed between transformed PPE and graduation rate, and whether that relationship was moderated by year. The predictor (transformed PPE) and moderator (year) were entered in block one of the model, and the interaction term (transformed PPE × year) was entered in block two. Results from the omnibus model were not significant, $F(2, 520) = 2.842, p = .059$, indicating variability of graduation rates was not significantly accounted for by both transformed per-pupil expenditures and year as a collective. As year was included as a moderator
variable, importance was placed on the unique contribution of PPE to graduation rates. Transformed PPE did not make a significant contribution toward predicting graduation rates, $\beta = 0.072$, $p = .100$. The relationship between PPE and graduation rate was also not moderated by year, $\Delta R^2 = .001$, $F(1, 519) = 0.376$, $p = .540$. Given that per-pupil expenditures did not significantly predict graduation rates, and no moderating effect of year was found, the null hypothesis was retained. Please see Table 4.8 for detailed results of the analysis. Presented in Figure 4.6 is a scatterplot depicting the relationship between raw PPE and graduation rates.

Table 4.8

Summary of Coefficients for Moderated Multiple Linear Regression between Transformed PPE and Graduation Rates, as Moderated by Year

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-Squared</th>
<th>Std. Error</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.104</td>
<td>.011</td>
<td>5.319</td>
<td>2.842</td>
<td>.059</td>
</tr>
<tr>
<td>2</td>
<td>.107</td>
<td>.012</td>
<td>5.322</td>
<td>0.376</td>
<td>.540</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Constant)</td>
<td></td>
<td>67.112</td>
<td>5.324</td>
</tr>
<tr>
<td></td>
<td>Log10_PPE</td>
<td></td>
<td>5.287</td>
<td>1.648</td>
</tr>
<tr>
<td></td>
<td>Year</td>
<td></td>
<td>0.801</td>
<td>1.722</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
<td></td>
<td>43.639</td>
<td>1.083</td>
</tr>
<tr>
<td></td>
<td>Log10_PPE</td>
<td></td>
<td>11.270</td>
<td>1.097</td>
</tr>
<tr>
<td></td>
<td>Year</td>
<td></td>
<td>16.259</td>
<td>1.524</td>
</tr>
<tr>
<td></td>
<td>Log10_PPE×Year</td>
<td></td>
<td>-3.940</td>
<td>0.613</td>
</tr>
</tbody>
</table>

Note. Dependent Variable: Graduation Rate
Figure 4.6. Relationship between untransformed PPE and graduation rate

**Hypothesis 3**

\( H_{3\text{Null}} \): There is no relationship between per-pupil expenditure and MAP scores in Missouri school districts and the relationship is not moderated by school year (2010 or 2011).

\( H_{3\text{Alternative}} \): There is a relationship between per-pupil expenditure and MAP scores in Missouri school districts and the relationship is moderated by school year (2010 or 2011).

Hypothesis 3 was similarly tested using moderated multiple regression to determine if a relationship exists between PPE and MAP scores, and whether the relationship was moderated.
by year. PPE was measured as indicated in the analysis of hypothesis 1. MAP scores were measured at the interval level and are defined as the sum of the mean scores across subjects and across grade levels within a district.

**Data cleaning.** Similarly to in the analysis of H1, data were screened for missing data and univariate outliers prior to testing H3. Once again, no cases with missing data were identified. Data were evaluated for univariate outliers in the same manner as was done in the analysis for H1. Raw scores for PPE and MAP scores were transformed to z-scores and compared against the critical value of +/-3.29 to determine outliers. Two positive outliers were identified among PPE, and each of these cases also contained negative MAP score outliers. Six additional negative outliers in four school districts were identified among MAP scores. All outliers were removed from the data. Thus, for H3, 534 cases of data were collected, and 526 were included in the analysis. Descriptive statistics for continuously scaled predictor (PPE) and criterion (MAP scores) variables are displayed in Table 4.9.

Table 4.9

*Descriptive statistics of Predictor and Criterion Variables for Hypothesis 3*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>526</td>
<td>6055.78</td>
<td>18065.88</td>
<td>8554.22</td>
<td>1739.633</td>
<td>2.347</td>
<td>7.231</td>
</tr>
<tr>
<td>MAP Scores</td>
<td>526</td>
<td>9761.20</td>
<td>10609.40</td>
<td>10230.59</td>
<td>124.370</td>
<td>-0.412</td>
<td>1.920</td>
</tr>
</tbody>
</table>

**Tests of normality.** The parametric assumption of normality was assessed for both the predictor (PPE) and criterion (MAP scores) variables in the same manner as was conducted for the analysis of H1 and H2. Resulting z-skew and z-kurtosis values are presented in Table 4.10.
As PPE was once again found to be significantly positively skewed and significantly leptokurtic (positively kurtotic), transformed (Log10_PPE) scores were used in the analysis of H3. MAP scores were also significantly skewed and kurtotic. Similar to graduation rates, however, transformation of the data did not improve results of the regression to significant levels; as such, untransformed MAP scores were entered into the analysis.

Table 4.10

*Skewness and Kurtosis of Hypothesis 3 Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness</th>
<th>Std. Error</th>
<th>z-skew</th>
<th>Kurtosis</th>
<th>Std. Error</th>
<th>z-kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPE</td>
<td>2.347</td>
<td>.106</td>
<td>22.035</td>
<td>7.231</td>
<td>.213</td>
<td>34.011</td>
</tr>
<tr>
<td>MAP Scores</td>
<td>-0.412</td>
<td>.106</td>
<td>-3.866</td>
<td>1.920</td>
<td>.213</td>
<td>9.029</td>
</tr>
</tbody>
</table>

**Linearity.** Linearity between the predictor and criterion variables was evaluated by reviewing the Normal P-P plot constructed using the residuals. No evidence of non-linearity was found in the residuals plot (Figure 4.7). As such, linearity was assumed between transformed PPE and MAP scores.
Figure 4.7. Residual plot for evaluation of linearity for hypothesis 3

Homoscedasticity. Adequate homoscedasticity, meaning variance across predicted criterion variable scores and all predicted scores is roughly equal (Pallant, 2007), is indicated by an even and centralized distribution of standardized residuals (Tabachnick & Fidell, 2007). Homoscedasticity was assessed by evaluating a standardized residual plot, similarly as to in the analyses of H1 and H3. As can be seen in Figure 4.8, heteroscedasticity is evident in the standardized residual plot, given that many cases fall outside of the desired centralized rectangular shape.
Results of Hypothesis 3. Using SPSS 20, a moderated linear regression was conducted to test whether a relationship existed between transformed PPE and MAP scores, and whether that relationship was moderated by year. The predictor (transformed PPE) and moderator (year) were entered in step one of the analysis, and the interaction term (transformed PPE × year) was entered in step two. Results from the omnibus model were significant, $F(2, 523) = 4.493$, $p = .012$, indicating the amount of variability of MAP scores that was accounted for by both transformed PPE and year as a collective. However, year was included as a moderator variable,
and thus importance was placed on the unique contribution of PPE to MAP scores. Transformed PPE did not make a significant contribution toward predicting MAP scores, $\beta = -0.036, p = .412$. The relationship between PPE and MAP scores was not moderated by year, $\Delta R^2 < .001, F(1, 522) = 0.039, p = .844$. As per-pupil expenditures did not significantly predict MAP scores and a moderating effect of year was not found, the null hypothesis was retained. Please see Table 4.11 for detailed results of the analysis. Presented in Figure 4.9 is a scatterplot depicting the relationship between raw PPE and MAP scores.

Table 4.11

Summary of Coefficients for Moderated Multiple Linear Regression between Transformed PPE and MAP Scores, as Moderated by Year

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-Squared</th>
<th>Std. Error</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.130</td>
<td>.017</td>
<td>123.550</td>
<td>4.493</td>
<td>.012</td>
</tr>
<tr>
<td>2</td>
<td>.130</td>
<td>.017</td>
<td>123.664</td>
<td>0.039</td>
<td>.844</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std. Error</th>
<th>Beta</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10413.163</td>
<td>279.535</td>
<td></td>
<td>37.252</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Log10_PPE</td>
<td>-58.389</td>
<td>71.091</td>
<td>-0.036</td>
<td>-0.821</td>
<td>.412</td>
</tr>
<tr>
<td>Year</td>
<td>31.068</td>
<td>10.774</td>
<td>0.125</td>
<td>2.884</td>
<td>.004</td>
</tr>
<tr>
<td>2</td>
<td>10579.622</td>
<td>893.012</td>
<td></td>
<td>11.847</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Log10_PPE</td>
<td>-100.800</td>
<td>227.484</td>
<td>-0.061</td>
<td>-0.443</td>
<td>.658</td>
</tr>
<tr>
<td>Year</td>
<td>-78.636</td>
<td>559.004</td>
<td>-0.316</td>
<td>-0.141</td>
<td>.888</td>
</tr>
<tr>
<td>Log10_PPE×Year</td>
<td>27.950</td>
<td>142.398</td>
<td>0.442</td>
<td>0.196</td>
<td>.844</td>
</tr>
</tbody>
</table>

Note. Dependent Variable: MAP Scores
Summary

This chapter presented the data analysis procedures and findings related to the three hypotheses testing the relationship of per-pupil expenditures (PPE) to district achievement when moderated by year (2010, 2011). The results indicated a significant negative relationship for hypothesis 1. No significant relationships were found for hypotheses 2 or 3. The results of the data analysis presented in Table 4.12 revealed that per-pupil expenditure is a predictor for
attendance rates, but not for graduation rates and MAP scores. Additionally, the relationship between per-pupil expenditure and attendance rates is not moderated by year (2010, 2011).

Table 4.12

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Predictor</th>
<th>Criterion</th>
<th>Moderator</th>
<th>Effect of Predictor</th>
<th>Effect of Moderator</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Transformed Per-pupil Expenditures (PPE)</td>
<td>Attendance Rates</td>
<td>School Year (2010 or 2011)</td>
<td>β = -0.168, p &lt; .001</td>
<td>β = -1.143, p = .616</td>
</tr>
<tr>
<td>H2</td>
<td>Transformed Graduation Rates</td>
<td>Graduation Rates</td>
<td>School Year (2010 or 2011)</td>
<td>β = 0.072, p = .100</td>
<td>β = -1.452, p = .540</td>
</tr>
<tr>
<td>H3</td>
<td>Transformed MAP Scores</td>
<td>MAP Scores</td>
<td>School Year (2010 or 2011)</td>
<td>β = -0.821, p = .412</td>
<td>β = 0.442, p = .844</td>
</tr>
</tbody>
</table>

The predictor variable, PPE, was transformed using a logarithmic (LG10) transformation resulting in outcomes similar to the raw data. The moderator variable of year was included in this study to test the potential impact of district budget cuts between the 2010 and 2011. Analysis of the data indicates that year is not a moderator for the relationship between PPE and district achievement over these years. Presented in Chapter Five is an overview of this study, summary of findings, conclusions and implications, recommendations for further study, and recommendations for practice.
CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Public education in the United States has entered another phase of accountability as No Child Left Behind (NCLB) standards are being replaced with national standards, national assessments, and new accountability standards for teachers and administrators. As states adopt annual performance standards, benchmarks, and evaluation tools defined in their NCLB waiver applications, the challenge for school districts comes in allocating resources effectively to meet these requirements. Research has been mixed about the impact of additional per-pupil expenditures on district and student achievement (Hanushek & Lindseth, 2009).

Public school funding in the United States is obtained primarily through federal, state, and local sources. Highlighted in the review of the literature, however, is the fact that educational mandates required to be implemented at state and local levels are often not funded at federal levels as promised by Congress. State and local districts are then left to fund increasing education costs in an attempt to meet national requirements. The same dilemma exists at the district level as state mandates are often unfunded or underfunded resulting in school districts having to meet these requirements with their local tax efforts.

States have been party to litigation with respect to funding distribution over the last four decades as it relates to both equity and adequacy. The distribution of state funds to schools is now required to stand the courts’ tests of equity across districts and the funding must be adequate at the state-level to ensure that students can meet mandated achievement levels. Though Missouri’s funding formula has passed the litmus test of the court for adequacy, it remains $235 million underfunded due to the recession’s negative impact on state income tax and sales tax.
Thus, the urgent challenge for districts and schools lies in allocating limited resources to maximize their impact on student achievement.

As presented in the review of the literature, past research has been inconsistent in linking per-pupil expenditure with student and district achievement. The Coleman Report (1966) initiated over four decades of research attempting to link school inputs to achievement. Specialists surmised from this report that education inputs had a negligent impact on student achievement, particularly when compared to the influence of family and friends. This report was followed by numerous studies culminating in Hanushek’s 1997 summary of school inputs versus achievement output studies. Hanushek’s meta-analysis showed no conclusive relationship between school expenditures and different measures of student and school district achievement (Schrag, 2003). Studies have continued to explore deeper into school input in an effort to find a relationship to achievement. For example, researchers such as Odden (2012) and Nye et al. (2004) have explored how school districts allocate their funds and what impact class size has at the different grade-levels or for students of different races. Recently, researchers (Ballou et al., 2004; Hanushek & Rivkin, 2010a; Haycock et al., 2004; Peske & Haycock, 2006; Sanders & Rivers, 1996) have explored characteristics of teacher quality in efforts to identify indicators common to teachers that consistently rank high in value-added to student achievement. It is imperative that researchers continue to analyze data comparing education funding to student achievement for groups of students (by race, gender, socioeconomic status, IEP students, and students of limited English proficiency) that have shown significant gains when provided additional resources. Reallocation of resources in relation to the research can help in removing the obstacles to social capital and promote vertical equity. The research in educational inputs as it relates to student achievement is clearly moving toward this more detailed approach in order to
isolate where additional educational resources can best impact achievement.

The purpose of this study was to examine the relationship between the amount of money dedicated to per-pupil expenditure by school districts and measures of student achievement. Specifically, 267 school districts within the state of Missouri were examined across years 2010 and 2011. These years in particular were chosen for inclusion in the analysis, as the state reduced funding from 100% in 2008-09 to 94% in 2011-12 (MoDESE, 2012). As such, the effect of this budget cut between 2010 and 2011 was of particular interest.

A better understanding of the impact of expenditure on student achievement can inform budgetary decisions and help educators make knowledgeable decisions with regard to instructional inputs. The research questions that framed this study were:

Research Question 1: What is the relationship between per-pupil expenditure (PPE) and attendance rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

Research Question 2: What is the relationship between per-pupil expenditure and graduation rates in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

Research Question 3: What is the relationship between per-pupil expenditure and MAP scores in Missouri school districts and is the relationship moderated by school year (2010 or 2011)?

These questions were answered through quantitative analysis consisting of three moderated multiple regressions. Data were collected from the public Missouri Department of Elementary and Secondary Education Comprehensive Data System Portal (MCDS). In Chapter Four, a full account of the results of the analyses was provided. A power analysis and details
concerning the transformation of per-pupil expenditure data were provided in Appendices A-B. The following section includes an overview of the findings organized according to each research question.

**Summary of Findings**

Three moderated linear regressions were conducted to address the research questions through testing hypotheses 1, 2, and 3. The sample consisted of data from 267 Missouri school districts across two years, resulting in 534 cases. Transformed values of the predictor variable, per-pupil expenditure (PPE), were entered with the moderating variable, year, in step one of each analysis. The interaction term between predictor and moderator was entered in step two of each analysis.

**Research Question 1.** The purpose of research question 1 was to determine if a relationship exists between per-pupil expenditures (PPE) and attendance rate, and whether that relationship is moderated by year. Results from the omnibus model were highly significant, $F(2, 520) = 13.538$, $p < .001$, indicating how well the variability was predicted by both transformed PPE and year as a collective. Importance was placed on the unique contribution of PPE to attendance rates, as year was a moderator. Transformed PPE made a significant, unique, slightly negative contribution toward predicting attendance rates, $\beta = -0.168$, $p < .001$. The relationship between PPE and attendance was not moderated by year, $\Delta R^2 < .001$, $F(1, 519) = 0.252$, $p = .616$. As PPE did significantly predict attendance rates, but the relationship was not moderated by year, the null hypothesis was partially rejected. Results of this study indicate that there is slight negative predictive relationship between per-pupil expenditures and attendance rates in Missouri school districts and that relationship is not moderated by school year (2010 or 2011).
Though this is a significant finding, it is important to remember this included only two years of data and the low side of the range is still a 92% attendance rate.

**Research Question 2.** The purpose of research question 2 was to determine if a relationship exists between PPE and graduation rates, and whether the relationship is moderated by year. Results from the omnibus model were not significant, $F(2, 520) = 2.842, p = .059$, indicating variability of graduation rates was not significantly predicted by both transformed PPE and year as a collective. Due to year being included as a moderator, importance was placed on the unique contribution of PPE to graduation rates. Transformed PPE did not make a significant contribution toward predicting graduation rates, $\beta = 0.072, p = .100$. The relationship between PPE and graduation rate was not moderated by year, $\Delta R^2 = .001, F(1, 519) = 0.376, p = .540$. PPE did not significantly predict graduation rates, and year was not a significant moderator; as such, the null hypothesis was retained. According to the results of this study, there is no predictive relationship between per-pupil expenditures and graduation rates in Missouri school districts, and the relationship is not moderated by school year (2010 or 2011).

**Research Question 3.** The purpose of research question 3 was to determine if a relationship exists between transformed PPE and MAP scores, and whether that relationship is moderated by year. Results from the omnibus model were significant, $F(2, 523) = 4.493, p = .012$, indicating variability of MAP scores was significantly predicted by both transformed PPE and year as a collective. Year, however, was included as a moderator variable, and thus importance was placed on the unique contribution of PPE to MAP scores. Transformed PPE did not make a significant contribution toward predicting MAP scores, $\beta = -0.036, p = .412$. The relationship between PPE and MAP scores was not moderated by year, $\Delta R^2 < .001, F(1, 522) = 0.039, p = .844$. The null hypothesis was retained as PPE did not significantly predict MAP
scores, and year was not a significant moderator. The results of this research study show no predictive relationship between per-pupil expenditures and MAP scores in Missouri school districts, and the relationship is not moderated by year (2010 or 2011).

Conclusions and Implications

Understanding the relationship between per-pupil expenditures and academic performance among schools can inform educators and policy makers in effective allocation of scarce educational resources. The results of this study seem to confirm the findings of Hanushek (1997, 2003) that per-pupil expenditures do not correlate with student achievement. The results also lend support to the position that he has testified to in state funding hearings and before legislatures across the nation over the last 40 years that an increase in funds to school districts will not assure improved student achievement unless schools and districts fundamentally change how funds are allocated. These findings also indicate that the work of Odden (2011, 2012) and Picus (2000, 2011) with respect to understanding how school districts and school buildings allocate their funds may be an excellent direction for future research. Both advocate for a closer look at how resources are allocated at the building level and Picus emphasizes the need for student-level data to improve the effectiveness of resource distribution.

The weak negative relationship seen between per-pupil expenditures and attendance rate suggests that there must be another factor that impacts attendance rates or possibly school districts have not focused significant resources in this area. The low range of attendance rates studied was 92% which equates to 14 days absent in 174 days of possible attendance. It seems counterintuitive that attendance rates would drop as school districts increase their per-pupil expenditures. One might surmise that attendance rates could be influenced by the size of a school district, proximity to an urban area, population density of the district, or location within the state.
A brief review of the demographic data for the districts studied by sorting according to attendance rates seems to rule out location within the state or proximity to a major urban population center as contributing factors. Whether the districts were urban, suburban, or rural, as well as the district size, did not seem to show any trend in the demographic data. One characteristic that has been studied by several researchers (Gottfried, 2009, 2010; Ready, 2010) and appears to have some bearing here is socioeconomic status as represented by percentage of students eligible for Free and Reduced Lunch (F&RL) in the demographic data.

The data also revealed that year was not a moderator when considering per-pupil expenditures in relation to attendance rate, graduation rate, or MAP scores. Therefore, the presumption that budget cuts over the two years studied would show an immediate negative impact on student achievement must be abandoned. On the contrary, it cannot be presumed that the budget cuts will not have a future negative impact on achievement. A longitudinal study would be necessary to assess the long-term impact. Even though per-pupil expenditures predicted an impact on attendance rate, that slightly negative relationship was not influenced by year.

As heteroscedasticity was witnessed in all three analyses, this indicates that there is likely an unaccounted for variable that is influencing attendance rates, graduation rates, and MAP scores when using per-pupil expenditures as a predictor. Perhaps further study of the demographic data in relation to these school districts could reveal an influencing variable. Gottfried (2010) used a delayed impact analysis by looking at achievement data a year after the change in the predictor variable (lagged achievement levels) and such an approach may be of value with respect to the data studied. Further study into the demographics of school districts
experiencing negative and positive growth with respect to these criterion variables could point to the variable or variables that are influencing these data.

The results of the analyses support the work of Hanushek (2010, 2003, 1997, 1986), who found in his four decades of research that increases in spending alone do not net a positive impact on student achievement. The results also bring merit to the work of several current researchers who are investigating school inputs at a deeper level. The work of Card and Krueger (1996), Krueger (2002, 2003), and Nye et al. (2001, 2002, 2004) with relation to smaller class sizes at different grade-levels and the impact of lower class size on different groups of students warrants further investigation, as this has long been a debate with regard to PPE. If research can determine where smaller class size has the largest pay off in student achievement, then this will help school leaders in assuring that their students and districts meet new standards of accountability, which includes closing achievement gaps. Preliminary work of Nye et al. (2001, 2002, 2004) would suggest that study of class size with relation to students of color and students from low socioeconomic backgrounds deserves further review.

Recommendations for Further Study

Several questions arose during the present analysis that would benefit from further research. If the study were repeated in five to ten years, would the impact of budget cuts be seen in longitudinal student achievement? Would the inclusion of several years of data, as opposed to only two years, reveal a significant relationship between the criterion variables and the predictor variable and would the relationship between PPE and attendance rates remain the same? Would disaggregating the MAP scores or attendance rate data by grade-level reveal a relationship to per-pupil expenditures for some grades levels? Would disaggregating school districts by location (urban, suburban, and rural), F&RL percentage, student of color percentage, characteristic of
teacher quality, weighted average daily attendance, or local assessed valuation reveal trends in achievement? Would disaggregating per-pupil expenditures by function code (K-12 instruction expenses versus utility expenses) show a prediction of attendance rates, graduation rates, or MAP scores? With the availability to identify several of these characteristics due to the Missouri Department of Elementary and Secondary Education Comprehensive Data System Portal (MCDS) that was created in 2011, future research may be able to answer several of these questions as it relates to the data studied.

Several recommendations for future research are made based on the findings of the present study. Specifically, there are four recommendations that might be considered as a natural extension to this study in order to advance the knowledge of improving student performance. First, with the availability to collect longitudinal data on the MCDS system, it could be beneficial to examine per-pupil expenditures as it relates to student achievement over a five to eight year period. Perhaps more years of data would show a relationship between per-pupil expenditures and student achievement as well as confirming or discounting the slight negative relationship between PPE and attendance rates. The author has been a part of two action research projects in high schools of over 1,700 students that found a relationship between secondary student attendance rates and student measures of achievement. In relation to these results, goals and action steps were developed as well as resources allocated in efforts to improve attendance rates. As research has historical shown a correlation between student attendance and student achievement (Casdas, 1993; Lamdin, 1996), it is imperative to understand what significance the slight negative relationship between PPE and attendance rates has in this study. Future research could look deeper into the attendance characteristics of the districts in the study to determine their degree of focus on attendance as well as the effectiveness of their policies and procedures.
related to student attendance. It would also be of particular interest to see if the recession and resulting budget cuts of 2010 have an impact on future graduation rates.

A second recommendation for further study is to evaluate the characteristics of teacher quality in the school districts and possibly even down to the school level. More research is being directed toward the impact of teacher quality on student achievement as it relates to value-added and inequitable distribution of quality teachers across districts and schools (Ballou et al., 2004; Hanushek & Rivkin, 2010a; Haycock et al., 2004; Peske & Haycock, 2006; Sanders & Rivers, 1996). If additional knowledge can be gained about measurable characteristics of teacher quality that influence value-add, then school officials can work more effectively with teachers to develop these skills and hence improve student achievement.

A third recommendation would be to use weighted per-pupil expenditures broken down by function code using school districts’ Annual Secretary to the Board Reports (ASBR). Since the Missouri Department of Elementary and Secondary (MoDESE) requires school districts to code expenses by function and report them as such on their ASBR, a future researcher could drill down to expenses that directly impact classroom instruction. Using the weighted average daily attendance to calculate per-pupil expenditure would allow a correction for districts that have a high number of students with Individual Education Plans (IEP), Limited English Language Proficiency (LEP), and student that qualify for Free and Reduce Lunch (F&RL). This would allow researchers to drill down to achievement of specific groups of students in specific schools within districts and allow them to isolate variables unique to individual schools. One could also delineate between elementary, middle school, and secondary expenses as well as instructional expenditures versus support services expenditures. This follows along with the work of Odden
and Picus (2011) that is fairly prescriptive on what school buildings should be spending on specific salaries and services in the reallocation of resources to improve student achievement.

Finally, due to the heteroscedasticity of the data, further consideration must be given to variables that might be influencing this data. Demographics of the school districts in this study need further evaluation in order to determine additional variables for consideration in a replication of the study. Perhaps grouping the data by district enrollment, considering population density or proximity to an urban center could be investigated. The work of Gottfried (2009, 2010) and Ready (2010) suggests that one variable to consider should be socioeconomic status of students, as their work indicates a connection between socioeconomic status and attendance rates. Mathis (2013) also suggests that socioeconomic factors are the most influential correlates of achievement tests and those nations that provide greater equalities of learning opportunities score higher on PISA exams. This variable could easily be brought into the study by using school districts’ Free and Reduced Lunch percentages (F&RL). Students per classroom teacher and average teacher salary are two additional variables in the MCDS database that have a direct connection to per-pupil expenditures and may provide better insight to a replication of this study.

**Recommendations for Practice**

Research and results of this study have led to several recommendations for policy-makers, school administrators, and classroom teachers. The onus first falls to policy-makers at the state and federal level to follow through with promises of adequate funding for education. State and federal legislatures have a history of unfunded and underfunded mandates as it relates to educational initiatives. When authority is exercised from the federal or state level with respect to educational improvement, the first step in implementation should always be identifying an adequate funding source to ensure the success of the initiative. States need to follow the advice
of Rebell (2011) and develop funding mechanisms like that in Vermont, which will withstand the economic downturns that the nation has experienced since 2008.

One common issue expressed by Hanushek and Lindseth (2009) as well as Odden and Picus (2011) in relation to district expenditures, referred to the lack of flexibility at the building level for expenditures and the need for funding of innovative programs to improve schools. These types of initiatives are often funded through federal or state grants, but the restrictions of use of those funds and resulting documentation can discourage school districts from applying for the funds. The required paperwork for the American Recovery and Reinvestment Act of 2009 is just one example of over-documentation of expensing federal funds.

Though the burden is on the state and federal government to provide adequate funding, it is equally important for administrators and teachers to make informed decisions with respect to expenditure of those funds. Picus et al (2008) found that even when district resources increase substantially, schools do not always use the additional funding to strategically improve student performance. Teachers and administrators must be innovative, yet they must prove through pilot programs that methods are effective in improving student achievement prior to wholesale adoption. Districts must heed the research that indicates a one size fits all approach to education is not always the most effective approach. Schools with a higher percentage of low socioeconomic students or students of color may benefit from smaller class sizes or social programs that may not show an immediate or direct connection to student achievement, however, they are important contributions to support the needs of the whole child. School officials must drill deeper to understand inequities within their districts and schools. Only then can they effectively and systematically remove the barriers to social capital and provide the vertical equity essential for all students to experience success. Finally, teachers and administrators must use
student data to make informed decisions with regard to educational expenditures. Collaboration around student data will continue to be an essential component for educators to effectively allocate scarce resources.

**Summary**

Educational resources have been particularly limited since the beginning of the national recession in 2008. This study looked at school district expenditure and achievement data over two years in one Midwestern state in an attempt to show that per-pupil expenditures would predict attendance rates, graduation rates, and MAP scores, and that the relationships were moderated by year. Such relationships would indicate the budget cuts from years 2010 to 2011 had a negative impact on student achievement; however, the only significant relationship evident from the study results was a slightly negative relationship between per-pupil expenditures and attendance rates. These results indicate that a clear connection between per-pupil expenditures and student achievement or graduation rates does not seem to exist. Therefore, advocating for increased spending on Missouri schools is not a valid argument without adjustments in how school districts allocate their resources. As resources are scarce for education and the State of Missouri is currently funding their distribution formula at less than 93%, it is extremely important that educators implement positive changes and allocate funds effectively to promote student achievement. Educators must be more diligent in evaluating these processes and programs that impact student achievement. Relying on research they must ensure that resources not only support horizontal equity, but more importantly vertical equity if achievements gaps are to be narrowed.

Future research with respect to educational expenditure and student achievement will need to include several additional variables not included in this study. The study indicates that
district demographics with respect to enrollment, teacher – student ratio, teacher quality, within district and within school quality teacher distribution, teacher salary, Free and Reduced Lunch percentage, and the percentage of students of color could be beneficial in future research. Disaggregating per-pupil expenditures in future study may also produce more informative results.

Hopefully, this study will push future researchers to delve deeper into those educational inputs that impact student and school achievement. Ideally, each student will have a plan for educational success and schools will have adequate resources to successfully implement that plan regardless of their location and demographics. Educators that are bold enough to question the status quo, initiate positive change, and advocate for children will transform our educational system to one that leads the world.
APPENDIX A: Power Analysis

t tests – Linear bivariate regression: Two groups, difference between slopes

Analysis: A priori: Compute required sample size

Input:
- Tail(s) = One
- $|\Delta \text{slope}| = 0.025$
- $\alpha \text{ err prob} = 0.05$
- Power (1-\$\beta\$ err prob) = 0.80
- Allocation ratio N2/N1 = 1
- Std dev residual $\sigma$ = 0.5
- Std dev $\sigma_{x1}$ = 5
- Std dev $\sigma_{x2}$ = 10

Output:
- Noncentrality parameter $\delta$ = 2.5000000
- Critical t = 1.6510713
- Df = 246
APPENDIX B: Transformation of Per-Pupil Expenditure (PPE) Data
REFERENCES


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Andrew Ray Kohl was born in Lisbon, Iowa on May 5, 1962. Andy is the son of Delmar and Marilyn Kohl of Windsor, Missouri. Andy graduated from Lincoln High School in Stanwood, Iowa, in 1980 and began his undergraduate studies at Northeast Missouri State University in Kirksville, Missouri. After a three year sabbatical to farm 6,500 acres near Windsor, Missouri with his father, Andy completed his undergraduate work at Central Missouri State University in Warrensburg, Missouri. In 1988, he earned a Bachelor of Science in Education degree majoring in Mathematics and minoring in Coaching. After nine years of teaching and coaching in the Kansas City suburbs, Andy began his graduate studies in Educational Administration with the University of Missouri – Kansas City. As part of UMKC’s Northland cohort program, Andy completed a Master of Arts degree in 1999 and an Education Specialist degree in 2001 earning the Academic Achievement Award for both degrees in Educational Administration. In 2000, Andy began his school administration career as an Administrative Assistant and held the positions of Assistant Principal, Associate Principal, and Principal at the high school level before taking on his position of the last five years as Assistant Superintendent for Finance. Andy started his doctoral program in PK-12 Educational Administration with the UMKC Northland cohort in the winter of 2008 and has 25 years of experience as a teacher and administrator in Missouri public schools.