The Relationship Between Per-Pupil Expenditures and Per-Pupil Professional Development Expenditures and Student Achievement in K-12 Public School Districts in Missouri

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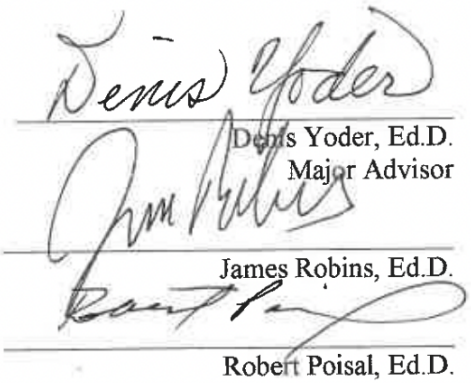

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Abstract

The first purpose of the quantitative study was to analyze archival school district data collected from the Missouri Department of Elementary and Secondary Education to determine the extent to which there is a relationship between total per-pupil expenditures and student achievement. A second purpose was to determine the extent to which there is a relationship between professional development per-pupil expenditures and student achievement. The third purpose of the study was to determine the degree to which district student enrollment affected the extent that the school district's per-pupil expenditures and professional development per-pupil expenditures are related to student achievement. The researcher of this study examined data from 438 public K-12 school districts in Missouri from the 2018-2019 school year. To address the purpose of this study, 16 research questions were posed and 16 hypotheses were tested. The dependent variables used to quantify student achievement were ACT composite scores, district graduation rate, and the percentage of students in the district who scored proficient or advanced on the English language arts and mathematics Missouri Assessment Program assessments for Grades 3-12. The results of hypothesis testing indicated no statistically significant relationship between per-pupil expenditures or professional development per-pupil expenditures and student achievement. When disaggregated by district enrollment, the results of the data analysis indicated that in certain instances, there were differences in the relationship between per-pupil expenditures and student achievement. In contrast, the results of the data analysis indicated that in no instance was there a statistically significant relationship between professional development per-pupil expenditures and student achievement. When the additional analysis disaggregated school districts into

four tiers based on enrollment, the data indicated six (four positive and two negative) statistically significant relationships between per-pupil expenditures and student achievement and one negative statistically significant relationship between professional development per-pupil expenditures and student achievement.

Dedication

This dissertation is dedicated to my wife, Shauna, and our three children, Rosalie, Calvin, and Braden. I love you all. To my parents, Mike and Laura Beth, for setting high expectations for me at a young age and never letting me settle. To my in-laws, Denny and Joyce, for always helping and believing in me. Finally, to the rest of my family who have loved and supported me through this journey.

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Finally, I would like to acknowledge that this dream started on July 27, 2012, when my father in-law joked that he always thought his daughter would marry a doctor in his wedding speech. He is now correct in his statement.

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Chapter 1

Introduction

Students enrolled in Algebra I learn the foundation of mathematical functions and that all functions are centered around inputs and outputs (Missouri Department of Elementary and Secondary Education [DESE], 2019a). The concept of functions can be applied to school funding. The United States Department of Education (USDE) passed in 1965 the Elementary and Secondary Education Act with the purpose to "provide all children significant opportunity to receive a fair, equitable, and high-quality education, and to close educational achievement gaps" (USDE, 1965, p. 8). With federal funding making up only approximately 8% of school revenue, there is immense pressure at the local level to produce additional funding (U.S. Department of Education, 2021). Through property-tax based school funding, financial incentives that are more beneficial to schools in wealthy communities have increased the existing divide between the *have* and the *have nots* now more than ever (Bryant, 2016). The main objective of public schools' finance systems is to provide adequate resources for school districts so that every student has equal opportunity to a positive educational outcome (Berne & Stiefel, 1983).

School districts operate in good faith that the money received from the federal, state, and local governments will be used strategically and intentionally to maximize student achievement. The philosophical question, "Does more money equal better results?" is often heard in education. Bryant (2016) argued the following:

> As a nation, we must wrestle with several critical questions: Is every child given the same quality of education? If not, why not? How do we feel

> about it? And what do we expect from children to whom we give inadequate academic support? (p. 2)

Such questions are continuously confounded by the fact that school funding is a rapidly moving target and it is yet to be proven the precise ways to direct expenditures to lift student achievement effectively (Hanushek, 2016). Chapter 1 includes the background, statement of the problem, purpose of the study, significance of the study, delimitations, assumptions, research questions, and definition of terms.

Background

Every school year, constituents of many public school districts in America enter into discussions regarding the funding of public schools in America and whether or not the amount of money spent on education is producing the desired result (Irvin, 2017). These discussions become convoluted when education professionals claim a decrease in student achievement as a result of insufficient funding (Baker & Weber, 2016). However, according to Hanushek (2016), per-pupil expenditures in the United States exceed nearly every other country in the world, yet U.S. student achievement is virtually unchanged from that in the early 1970s.

Validation of expenditures has been even more pertinent in the uncertain economic landscape due to the hardships of the COVID-19 Pandemic of 2020. COVID-19 disrupted K-12 education more than could have been imagined (Kurtz, 2020). Initially, the Missouri state government withheld $123.3 million from the K-12 education budget in June and July of 2020 due to the 2020 COVID-19 Pandemic before the money was restored to the budget in March 2021 (Associated Press, 2021). In turn, districts have been forced to be even more deliberate with their instructional expenditures.

Moving forward, school district leaders will continue to address how they allocate funds to meet the needs of their staff and students to maximize student achievement.

Statement of the Problem

There have been multiple studies conducted on the impact of per-pupil expenditures and the effect of professional development on student achievement across the United States. According to Michalski (2020), "Published research pertaining to student performance and funding has led to conflicting findings of whether instructional expenditures impact student achievement" (p. 6). Hanushek (2007) found that the majority of his studies reported no consistent relationship between expenditures and achievement in the United States. Michalski (2020) supported this by finding no relationship between per-pupil expenditures and student achievement for public schools in the state of Arizona. In contrast, Cullen, Polnick, Robles-Piña, and Slate (2015) found a positive relationship in Texas school district between instructional expenditures and student achievement for the 2006-2010 school years. As Texas school districts increased instructional expenditures, student achievement increased as well.

The conflicting results and conclusion from studies on the relationship between per-pupil expenditures and student achievement supports additional research on the topic. In addition, there is little evidence of the relationship between per-pupil expenditures and student achievement in the state of Missouri. Specifically, there is a lack of evidence on the relationship between professional development per-pupil expenditures and student achievement in the state of Missouri. Furthermore, there is little evidence to address how the numbers of students enrolled in a school district impacts the relationship between per-pupil expenditures and student achievement. It is important for additional research to be

conducted to determine if the relationship between per-pupil expenditures and student achievement are impacted by school district student enrollment.

Purpose of the Study

The first purpose of this quantitative study was to analyze archival school district data collected from the DESE to determine the extent to which there is a relationship between total per-pupil expenditures and student achievement. A second purpose was to determine the extent to which there is a relationship between professional development per-pupil expenditures and student achievement. The third purpose of the study was to determine the degree to which district student enrollment affected the extent that the school districts' per-pupil expenditures or professional development per-pupil expenditures are related to student achievement.

Significance of the Study

The results of the study provide a contribution to the educational research base and add to the scientific body of literature regarding factors that are associated with student achievement. The results could aid school district leaders in allocating funds to support instruction and professional development within an ever-changing financial landscape. Furthermore, the study results could help determine to what degree the number of students enrolled in a school district impacts the relationship between per-pupil expenses and student achievement. Additionally, the results could be utilized by school district leaders for analyzing budget priorities to most effectively allocate school funds to promote student achievement.

Delimitations

According to Lunenburg and Irby (2008), "Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study" (p. 134). The following delimitations were used in this study:

- Data from the 2018-2019 school year were utilized in the study.
- Data were collected from the 438 K-12 Public School Districts in the state of Missouri.
- Eight charter schools and nine public schools were removed from the study due to incomplete data.
- The data used to measure student achievement were limited to the following: Missouri Assessment Program (MAP) English language arts and mathematics results for Grades 3-12, composite ACT scores, district graduation rates, the number of students enrolled in a school district, per-pupil expenditures, and professional development per-pupil expenditures.

Assumptions

Lunenburg and Irby (2008) defined assumptions as, "postulates, premises, and propositions that are accepted as operational for purposes of the research" (p. 135). The following assumptions were made in this study:

- All financial information was accurately submitted to DESE by the 438 K-12 public school districts in Missouri.
- The number of students enrolled in the school district and graduations rates of the 438 K-12 public school districts in Missouri were accurately submitted to DESE.

- All MAP and End-of-Course Exam (EOC) scores reported by DESE for the 438 K-12 public school districts in Missouri were complete and were an accurate reflection of student achievement.
- All ACT scores reported by DESE for the 438 K-12 public school districts in Missouri were complete and were an accurate reflection of student achievement.

Research Questions

Sixteen research questions were analyzed in this study. Research questions 1-4 addressed the potential relationship between total per-pupil expenditures and student achievement and research questions 5-8 addressed the potential relationship between professional development per-pupil expenditures and student achievement. Research questions 9-16 addressed the difference, if any, in the relationship between professional development per-pupil expenditures and student achievement based on district student enrollment.

RQ1. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

RQ2. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district graduation rate?

RQ3. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the

percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

RQ4. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

RQ5. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

RQ6. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate?

RQ7. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

RQ8. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

RQ9. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil

expenditures and student achievement, as measured by the district average composite ACT score?

RQ10. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district graduation rate?

RQ11. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

RQ12. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

RQ13. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

RQ14. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate?

RQ15. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12?

RQ16. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12?

Definition of Terms

Lunenburg & Irby (2008) specified that key terms be defined to avoid confusion and provide a common understanding of key terms central to the study. The following three terms are defined:

Per-Pupil expenditure. According to DESE (2019d), per-pupil expenditures are defined as: "Total instruction and support expenditures in a fiscal year excluding: capital outlay, debt service, community services, non-instruction/support, adult education, and Title I expenditures divided by September membership as reported on the last Wednesday in September" (p. 1).

Professional development. DESE (2021c) defined professional development as "activities designed to contribute to the professional development of staff members and the administrators that oversee instruction, such as principals and superintendents during the time of their service to the school system" (p. 128). For the purpose of this study,

professional development per-pupil expenditures include expenditures from function codes 2214 (Professional Development) and 2213 (Instructional Staff Training Services) as reported in the Annual Secretary of the Board Report. Function code 2214 can only be used to record expenditures that align with the school district's Comprehensive School Improvement Plan and meet the requirement of Section 160.530, RSMo, to allocate at least one percent of current year basic formula to professional development (DESE, 2021c). DESE (2021c) defined function code 2213:

> activities designed to contribute to the professional or occupational growth and competence of members of the instructional staff and the administrators that oversee instruction, such as principals and superintendents, during the time of their service to the school system or school. Among these activities are in-service training (including mentor teachers), workshops, conferences, demonstrations, school visits, courses for college credit (tuition reimbursement), and travel associated with these trainings. The cost associated with providing substitute teachers in the classroom while the regular teachers attend training should be included in this code. Those expenditures that fall outside the direction of the board approved school improvement plan or above that required by Section 160.530, RSMo, should also be included to this code. (p. 128)

District student enrollment. According to DESE (2019d), district student enrollment is defined as the "count of students taken the last Wednesday of September of all students in grades K through 12 enrolled in a school district." For the purposed of this study, school districts were disaggregated into four tiers

based on their district student enrollment. Tier 1 is comprised of 164 school districts who had less than 500 students enrolled in their districts. Tier 2 contains 111 school districts that range between 500-1,000 students. There are 127 school districts in Tier 3 that range from 1,001-5,000 students. Tier 4 contains the remaining 36 school districts whose number of students enrolled in the school district is greater than 5,000.

Organization of the Study

This quantitative study was divided into five chapters. The introduction, background, statement of the problem, purposes of the study, significance of the study, delimitations, assumptions, research questions, and definition of terms were included in Chapter 1. Chapter 2 provides a review of the literature that pertains to the research questions along with school funding, expenditures, and student assessments. An analysis of the methodology utilized in the study is in Chapter 3. The findings of the study are presented in Chapter 4. Chapter 5 includes a summary of the study, findings related to the literature, implications for action, recommendations for future research, and concluding remarks.

Chapter 2

Review of the Literature

There is conflicting research on the relationship between per-pupil expenditures and student achievement. There is also minimal research on the relationship between professional development per-pupil expenditures and student achievement in the state of Missouri. Both relationships will be examined further along with a review of literature on each topic. In closing, literature will be reviewed on how student enrollment in a school district influences the relationship between per-pupil expenditures and student achievement.

Public school districts in the state of Missouri are funded from three sources: federal, state, and local agencies. Revenue from these agencies is then placed into four funds: general fund, special revenue fund, debt service fund, and capital fund. Each fund is unique and can only be spent on specified items. In this chapter, school funding and each revenue agency is described in full detail.

School Revenue in Missouri

The U.S. Department of Education (USDE) was founded in 1867 to gather information and to create a more equitable and efficient public school system (USDE, 2021). Throughout the years and the passing of acts, laws, and amendments, the role of the department has increased and includes providing monetary support of U.S. public school systems. The USDE elementary and secondary programs serve 18,200 school districts across America and school districts receive approximately 8% of their total funding from the federal government (USDE, 2021). Federally funded programs include: Medicaid, Perkins Grant, IDEA Grants, National School Lunch and Breakfast Program

Grant, Title Programs, and other federally funded programs (DESE, 2021c). With the federal government covering only 8% of total funding, school districts are left to rely predominately on state governments to allocate resources to help fund public education.

In 1993, multiple school districts in Missouri, also known as the Committee of Educational Equity, filed a lawsuit against the state of Missouri in regards to DESE's funding formula. In the lawsuit, the Committee of Educational Equity claimed that the funding formula "has resulted in inequities in the distribution of money to school districts and, thus, inequities in the quality of education provided to individual students in different parts of the state (Committee for Educ. Equality v. State, 1994, para. 1). In response to Committee for Educ. Equality v. State, Senate Bill 380 (SB 380) was passed which included a new funding formula for public school districts. SB380, also known as the 'Outstanding Schools Act,' established a new funding formula that would distribute funds to school districts based on the student enrollment of a district and then adjusted for the local wealth of the district in hopes of creating a more equitable funding formula (Welker, 2006). In 2004, the Committee for Educational Equality once again filed a lawsuit against Missouri, that the current funding formula (SB 380) "results in a public education system that is unconstitutionally disparate and inadequate (Committee for Educ. Equality v. State, 2004, para. 1). Although SB 380 did prove to be constitutional, the General Assembly expressed "the best intentions in improving the education of the state's schoolchildren by establishing a standard of adequacy (Committee for Educ. Equality v. State, 2009, para. 513).

During the 2006-2007 school year, Missouri implemented a new funding method for K-12 public school districts through Senate Bill 287 (SB 287) in hopes of providing a

more equitable and adequate education for all students than the previous formula established under SB 380 (Shuls, 2012). SB 287 differed from SB 380 as it focused more on student needs as opposed to being tax-based driven (Welker, 2006). Ceam (2022) provided a breakdown of the state funding formula as, "Weighted Average Daily Attendance x State Adequacy Target x Dollar Value Modifier – Local Effort = State Support" (p. 3).

To compute the weighted average daily attendance (WADA) of a school district, the average daily attendance (ADA) must be calculated. ADA includes data from the school year as well as summer school and was defined by Ceam (2022) as, "a measure of how many students attend school by the number of hours spent in school" (p. 3). The number of students in the districts who qualify for free & reduced lunch (FRL), have an individualized education plan (IEP) and are limited English proficient (LEP) is multiplied by the state designated threshold percentage, and anyone over the threshold is given a weighted calculation (DESE, 2022d). The thresholds for the 2018-2019 school were 31.42% for FRL, 12.06% for IEP, and 2.5% for LEP which are much lower than the percentages of all students enrolled in public school districts in Missouri (DESE, 2022d). Of all students enrolled in public school districts in Missouri during the 2018-2019 school year; 51.2% qualified for FRL, 13.1% had an IEP, and 3.5% were LEP (DESE, n.d.). When entering the WADA into the funding formula, districts are allowed to use their highest WADA from the current or previous two school years (DESE, 2022d).

Once a school district's WADA is established, the WADA is multiplied by the state adequacy target. The state adequacy target is the cost established by DESE that is required to educate a student without special needs or services (Welker, 2006). DESE

develops the state adequacy target by using the data from the schools who have a perfect score on the Annual Performance Report (Welker, 2006). In the 2018-2019 school year, the state adequacy target was $6,308 (DESE, 2022a). The product of the WADA and state adequacy target is multiplied by the Doller Value Modifier (DVM) (DESE, 2022a). The DVM fluctuates from district to district based on the cost of living in that area of the state. Ceam (2022) defined DVM as "comparing the regional wage ratio for the district (the average salary in the area) with the state median wage per job" (p. 4).

Local funding is subtracted from the product of the WADA and the state adequacy target and the product of the DVM. Local funding that a district receives is based on the property values, revenue from other local sources, and historical property values withing the district (EdBuild, 2022). Missouri has established a performance tax levy of 3.43% of assessed valuation that all school districts must abide by (Shuls, 2012). Collector and assessor fees are deducted from the total local effort (Ceam, 2022). Also included in local funding is 50% of the proposition C (prop C) money that a district receives that school year (DESE, 2017). DESE (2017) described prop C as

> a $0.01 state-wide general tax general tax for education with a corresponding property tax reduction for school districts. Prop C sales tax revenue is collected locally, transmitted to the state and then passed on to the school districts based on an amount per prior year WADA amount. (p. 9)

The Missouri funding formula was designed to assist school districts in garnishing more state money where needed and has built-in provisions to ensure that a school district's funding does not decrease (Shuls, 2012). Districts with less than 350 students

are classified as hold-harmless and are guaranteed to receive at minimum the same amount of state funding that they received in 2005-2006 when funding formula SB 287 was implemented (Shuls, 2012). School districts with more than 350 students can also classify as hold-harmless if their state funding per-WADA would be lower than the funding the district received in 2005-2006 (Shuls, 2012). During the 2019 fiscal school year, there were 160 K-12 public school districts classified as hold-harmless school districts (DESE, 2022a). Of those 160 school districts, 110 districts classify as Tier 1 (≤500 students, 21 districts classify as Tier 2 (501-1,000 students), 19 districts classify as Tier 3 (1,001-5,000 students), and 10 districts classify as Tier 4 (≥5,000 students) when disaggregating the data based on the study's tier system.

School districts with an enrollment of less than 350 students qualify for a small school grant. $10 million dollars was distributed per ADA as well as $5 million dollars that was distributed by tax rate based on a district's prior year ADA (DESE, 2021d). Using the district's 2017-2018 ADA for the 2018-2019 school year, qualifying schools received a $434.44 per student (DESE, 2021d). There were 127 K-12 public school districts in the 2018-2019 school year that had less than 350 students and would have qualified for the small school grant (DESE, 2021d).

In addition to the revenue that school districts receive from the funding formula, school districts also receive funding through the Classroom Trust Fund which is the gambling monies portion of the funding formula. Under Missouri Revised Statute 163.043 of the Missouri Constitution (2009), the Classroom Trust Fund may be used by the district for (a) teacher recruitment, retention, salaries, or professional development; (b) school construction, renovation, or leasing; (c)

technology enhancements or textbooks or instructional materials; (d) school safety; or (e) supplying additional funding for required programs, both state and federal. The amount of money that is allocated to school districts is calculated on the district's previous year's ADA. During the 2018-2019 school year, the Classroom Trust Fund amassed a total of $343,908,778 which amounted to a payment of $417.68 made per the district's 2017-2018 ADA (DESE, 2021a).

Findings Related to the Missouri Funding Formula

There have been multiple studies that have examined the adequacy and equity of SB 287 since its introduction with varied results. James Welker conducted an initial study in 2006 to the validity of SB 287 compared to SB 280. Welker (2006) found no positive correlation between per-pupil expenditures and student performance. Welker concluded that SB 287 was more equitable than the previous funding formula, however perfect equity would not be obtainable with the new formula in its current state (Welker, 2006). Monsees (2011) argued that, "the funding formula has not improved horizontal equity over the SB 380 formula it replaced, based on the measurements of the federal range ratio or coefficient of variation" (p. 92). However, based on the findings, Monsees (2011) did point out that "SB 287 was successful at distributing more funds to districts with populations of students with higher needs as determined by student achievement outcomes" (p. viii). Hill, DeMott, & Hurley (2020) conducted a study to reassess Welker's 2006 study and examine the extent SB 287 provided adequacy and equity in 2018 compared to the formula's introduction in the 2006. Similar to Welker, Hill et al. (2020) concluded that SB 287 proved to be ineffective in providing adequacy as a whole. However, Hill et al. (2020) did conclude that SB 287 does provide vertical equity for

students in sub groups such as economically disadvantaged, special education, and limited English proficient.

Per-Pupil Expenditures and Student Achievement

Revenue that public school districts receive in Missouri is placed in four separate funds: General (Incidental Fund), Special Revenue (Teachers Fund), Capital Projects Fund, and Debt Service Fund (DESE, 2021c). Each of the four funds is "an account for all financial transactions of specific activities of a local education agency's operation in accordance with special regulations, restrictions, or limitations (DESE, 2021c, p. 9). The General Fund was defined by DESE (2021c) as an

> account for all financial resources except those required to be accounted for in another fund. This fund accounts for transactions involving local taxes; Foundation Program payments such as Basic Formula, Transportation, Early Childhood Special Education, Career Ladder, Educational Screening Entitlement/PAT and Vocational/At-Risk; along with various other transactions associated with federal projects. (p. 10)

All expenditures are posted under function codes that allow school districts to disaggregate their data to provide documentation on where funding is being utilized. Code numbers are assigned to expenditures and each function code consists of three parts; class, subclass, and detail (DESE, 2021c). Expenditures coded as per-pupil expenditures are expensed from the General Fund and their class code is found in the 1000 series. DESE (2019d) defined per-pupil expenditures as:

> total instruction and support expenditures in a fiscal year excluding: capital outlay, debt service, community services, non-instruction/support,

> adult education, and Title I expenditures divided by September membership as reported on the last Wednesday in September. (p. 1)

For the 2018-2019 school year, all public school districts in the United States totaled $800 billion in expenditures which equated to $13,701 in per-pupil expenditures (National Center for Education Statistics, 2022b). This was higher than Missouri's state per-pupil expenditures of $11,249.43 (DESE, n.d.).

When comparing student achievement, Missouri had a higher graduation rate than national average in 2018-2019. Missouri's graduation rate was 89.6% which was 3.6% higher than the national average of 86% (DESE, n.d. & National Center for Education Statistics, 2022a). When comparing ACT results of the 2019 graduates, Missouri students scored an average composite score of 20.6 which was 0.1 lower than the national average composite score of 20.7 (ACT, 2019a; DESE, n.d.). Furthermore, the National Center for Education Statistics (n.d.) found no significant difference between Missouri assessment scores and the national assessment scores when comparing 4th and 8th grade reading and mathematics scores from the 2018-2019 school year. Missouri students were able to perform relatively equal, if not better, than the national average graduation rate, composite ACT score, and performance assessment scores during the 2018-2019 school year despite Missouri public schools spending approximately $2,452 less in per-pupil expenditures.

A number of doctoral studies have discovered a positive relationship in regards to per-pupil expenditures in public school districts and student achievement. In 2015, Goins conducted a study in Tennessee examining whether students performed better academically if they attend a district with higher per-pupil expenditures. Similar to this

researcher's study, Goins used district ACT scores as a means of measuring student achievement within a district. Goins' (2015) study showed that "students in Tennessee K-12 public schools performed better academically from 1999 through 2009 if they attended districts with higher per-pupil expenditures" (p. 62). Albeit Goins pointed out that more money does have an impact on student achievement, "how administrators spent the money was more important than how much the spend" (Goins, 2015, p. 64).

Sander examined the relationship between expenditures and student achievement in Illinois. Similar to Goins, Sander used district ACT scores as a means to measure student achievement. Sander's study differed from Groins' study in the fact that Sander also analyzed the relationship between expenditures and student achievement after adjusting for poverty. Overall, Sander concluded "educational spending does make a positive difference on student academic performance" (Sander, 2017, p. 80).

In 2022, Hubner (2022) studied the relationship between per-pupil expenditures and student outcomes in New Hampshire over six- and ten-year spans. Instead of using ACT scores such as Goins and Hubner to measure student achievement, Hubner used graduation rate and standardized mathematics and English language arts scores (Hubner, 2022). The results of Hubner's analyses (2022) revealed a "statistically significant positive correlation with a 0.9% and 0.6% variance in English language arts and mathematics test scores, respectively, and a 4.2% variance in graduation rates" (p. 128). Based on the data, Hubner concluded, "Money does matter in the state of New Hampshire" (p. 129).

A multitude of studies have provided evidence for a negative relationship between per-pupil expenditures and student achievement. Brazeale conducted a study in 2014

analyzing the relationship between per pupil expenditures (among other independent variables) and student achievement in Missouri. Brazeale (2014) used school districts' Annual Performance Report score to measure student achievement. Each public school district, or local educational agency, produces an Annual Performance Report score based on how they perform in two sections of the Missouri School Improvement Program (MSIP) (DESE, 2022b, p. 2). The two sections of the MISP are "Performance metrics, which measure student outcomes, and Continuous Improvement metrics, which assess the quality of the work of the LEA toward improving the opportunities provided to all students (DESE, 2022b, p. 2). In conclusion, Brazeale's (2014) results of the analyses suggested a weak negative correlation between per-pupil expenditures and student achievement and "that student achievement actually improved with a lower level of spending" (p. 92).

In Pennsylvania, Potutschnig (2019) conducted a study examining the relationship between per-pupil expenditures and student performance, as measured by a school's School Performance Profile (SPP) score. Similar to Missouri using Annual Performance Report scores to measure school district success, Pennsylvania utilized SPP scores to measure a school district's progress and outcomes. Potutschnig (2019) found that in Pennsylvania, "spending in a specific area does not guarantee increases to the Weighted SPP Scores" (p. 190).

In 2016, Case used the outcomes of the Algebra I End of Course Assessment (ECA) and English/Language Arts 10 ECA as a dependent variable when examining the relationship between per-pupil expenditures and student achievement in the state of Indiana (Case, 2016). Case (2016) study "found a significant negative impact on student

achievement on the Algebra I ECA and English Language Arts 10 ECA in relationship to the amount of dollars given in total funding" (p. 79). Case (2016) drew the conclusion that "there needs to be a greater emphasis on the human capital" and every district "needs to focus on the nonmonetary factors that improved student achievement" (p. 91).

Shupe examined the relationship between per-pupil expenditures and the average Standards of Learning (SOL) pass rate for public school districts in Virginia from 2007 to 2017 (2019). Similar to Missouri's MAP assessment's, SOL was the standardized test that students in Grades 3 through 12 take in the Commonwealth of Virginia (2019). Shupe's (2019) concluded, "the relationship between per pupil expenditure and student achievement as measured by SOL pass rate to be negatively correlated…from 2007 to 2017" (p. 67). Furthermore, "increased spending had not produced higher test scores, nor can increased spending consistently predict higher performance on SOL pass rate" (Shupe, 2019, p. 67).

Several studies have examined the relationship between per-pupil expenditures and student achievement, as measured by ACT scores. A 2015 study conducted in South Dakota by Mike Lodmel analyzed the relationship between per-pupil expenditures and ACT scores during the 2012-2013 school year. Lodmel's (2015) results suggested annual per-pupil expenditures had a significant negative relationship with ACT scores. However, Lodmel (2015) drew several conclusions as to why per-pupil expenditures would have a negative relationship with ACT scores and suggested that a district's "ability to spend money wisely would take precedence on student outcomes over receiving additional dollars, which may or may not translate to higher student achievement" (p. 80).

Irvin conducted a similar study in Tennessee on the relationship between per-pupil expenditures and ACT composite scores for the 2013-2014, 2014-2015, and 2015-2016 school years. Although the results from Lodmel's study suggested a negative relationship, the data from Irvin's study indicated no significant relationship between per-pupil expenditures and ACT scores in all three school years (2017). Furthermore, the study also examined graduation rates as a dependent variable and found no significant relationship between per-pupil expenditures and graduation rates in two of the three school years (Irvin, 2017).

Martin (2020) also conducted a study on school funding and ACT composite scores of Juniors in Mississippi public school districts. As opposed to using total per-pupil expenditures, Martin used only instructional per-pupil expenditures as the independent variable (Martin, 2020). Based on the findings of the study, Martin concluded, "funding has a negative effect on student achievement as measured by ACT scores" (p. 118).

Professional Development and Student Achievement

DESE (2021c) defined professional development as "activities designed to contribute to the professional development of staff members and the administrators that oversee instruction, such as principals and superintendents during the time of their service to the school system" (p. 128). School districts are required to allocate, at minimum, one percent of the current year basic formula to professional development (DESE, 2020). Professional development expenditures were coded as 2214 (Professional Development) and 2213 (Instructional Staff Training Services) in the Annual Secretary of the Board Report. Function code 2214 (Professional Development) can only be used to

record expenditures that align with the school district's Comprehensive School Improvement Plan and meet the requirement of Section 160.530, RSMo, to allocate at least one percent of the current year basic formula to professional development (DESE, 2021). DESE (2021) defined function code 2213 (Instructional Staff Training Services) as:

> Activities designed to contribute to the professional or occupational growth and competence of members of the instructional staff and the administrators that oversee instruction, such as principals and superintendents, during the time of their service to the school system or school. Among these activities are in-service training (including mentor teachers), workshops, conferences, demonstrations, school visits, courses for college credit (tuition reimbursement), and travel associated with these trainings. The cost associated with providing substitute teachers in the classroom while the regular teachers attend training should be included in this code. Those expenditures that fall outside the direction of the board approved school improvement plan or above that required by Section 160.530, RSMo, should also be included to this code. (p. 128)

Revenue from the General Fund (Incidental Fund) and the Special Revenue (Teacher Fund) can be spent on professional development expenditures. DESE (2021c) defined the General Fund as an

> account for all financial resources except those required to be accounted for in another fund. This fund accounts for transactions involving local taxes; Foundation Program payments such as Basic Formula,

> Transportation, Early Childhood Special Education, Career Ladder, Educational Screening Entitlement/PAT and Vocational/At-Risk; along with various other transactions associated with federal projects. (p. 10)

DESE (2021c) defined the Teachers Fund as, "an account for revenue sources legally restricted to expenditures for the purpose of teachers' salaries and benefits and tuition payments to other school districts" (p. 10).

To ensure that all school districts are implementing professional development within their building, DESE requires all educators to participate in a set number of hours of professional development annually. These professional development hours were to be recorded by the educator and verified by the school district. Educators with an initial certification would need to accumulate a total of 30 contact hours of professional development within a school year (DESE, 2022c). The annual professional development requirement for educators with a career certification was reduced to 15 contact hours (DESE, 2022c). A teacher could become exempt from the professional development requirements if they met two of the three stipulations: 10 years of teaching, earned the next higher degree, or have received their national teaching certification (DESE, 2022c).

Similar to per-pupil expenditures and student achievement, the relationship between professional development per-pupil expenditures and student achievement has produced mixed results. Dalton (2010) examined the relationship between professional development instructional expenditures and student achievement in middle/junior and senior high schools in Texas. To measure student achievement, Dalton used campus average scale scores on the Texas Assessment of Knowledge and Skills (TAKS) (Dalton, 2010). Dalton found that when conducting the study in Texas using data from the 2006-

2007 school year, professional development per-pupil expenditures had "no relationship to social studies scale scores, while ELA, mathematics, and science tended to decrease as expenditures increased" (p. 49). Johnston (2013) conducted a similar study in Texas to assess the relationship between professional development per-pupil expenditures and student achievement, using TAKS as the dependent variable. Johnston's (2013) study differed from Dalton in the fact that Johnston disaggregated the school districts into two categories: property wealthy and property poor. Johnston (2013) concluded that regardless if a school district is designated as property wealthy or property poor, "there is no significant relationship in professional development expenditures and student achievement in Texas public school districts (p. 58).

Bartels conducted a study of the 2012-2013 school year in Missouri to examine the impact of school district financial allocations on district effectiveness (2014). Professional development per-pupil expenditures were one of many independent variables used in the study and district effectiveness was measured by using district MSIP scores. In the study, Bartels (2014) concluded that "district effectiveness decreased when a district spent more on professional development per pupil" (p. 55).

Similar studies conducted in the past have shown little to no relationship between professional development per-pupil expenditures and student achievement. Bryant (2016) conducted a study examining the relationship between per-pupil expenditures and on student outcomes on the Michigan statewide student assessment. Bryant (2016) determined there was a relationship between spending on instruction and student achievement, however the "effect size on the model was less than .00002" (p. 78). Factors such as subject, grade level, students/teacher ratio, district type, and racial

composition, all had a larger impact on the percentage of students who scored proficient/advanced on the assessments than per-pupil expenditures (Bryant, 2016).

Cooper conducted a similar study in Missouri in 2022 that produced conflicting results. Cooper found "a negative statistical relationship between district-level professional development expenditures and student achievement as measured by English language arts MAP scores" (p. 117). However, Coper (2002) found "no statistical relationship between district-level professional development expenditures and student achievement when measured by mathematics MAP scores" (p. 119). Cooper (2022) did caution that despite the findings of his study, "it does not disqualify that resources, such as professional development, may have other positive effects on the framework of public education" (p. 127).

Findings Related to the Relationship Between School Size, Expenditures, and Student Achievement

Multiple studies have been conducted related to the relationship between school size, expenditures, and student achievement. The results of these studies have varied and produced mixed results to determine if school size affects the relationship between per-pupil expenditures and student achievement. Hayes (2018) conducted a study in Illinois to determine if the size of a district affected student achievement and per-pupil expenditures. The results of Hayes' (2018) study indicated no relationship between district size and student achievement and that "district size cannot be used to predict student achievement" (p. 79). In relation to expenditures, Hayes (2018) concluded, "the bigger the district size the less the district per-pupil expenditures will be" (p. 80). Hayes

(2018) did caution that since he didn't determine causality, he "cannot state that the size of the district causes lower expenditures and better student achievement" (p. 87).

Durbin (2018) conducted a study in South Carolina to examine the relationship between school size, per-pupil expenditures, and student achievement, as measured by state test scores. When controlling for socioeconomic status, "the large size grouping in this study produced significantly higher academic achievement scores and significantly lower per-pupil expenditures (Durbin, 2018, p. 71). Durbin (2018) concluded, "students in larger schools scored significantly better on standardized achievement tests and…larger schools were less expensive to operate" (p. 83).

Roberts (2002) sought to determine if middle school size and per-pupil expenditures could predict student achievement in South Carolina public schools. Socioeconomic status and students with disabilities were controlled in the study (Roberts, 2002). Roberts' findings concluded that "smaller schools, though more expensive to operate, produce better results at least at the middle school level in South Carolina" (p. 77).

Savage (2003) conducted a study in New Jersey to address educational cost effectiveness and educational cost efficiency. Based on the data, Savage (2003) "refutes the belief that larger schools were more cost effective, and refutes as well the concept that schools need to spend more to perform better academically" (p. 94). However, these findings do not coincide with similar studies conducted by other researchers in New Jersey who found that "educational expenditures should be carefully reviewed and analyzed to ensure the money is being utilized in a thorough and efficient manner to ensure students the best educational opportunity" (p. 100).

Carpenter (2006) sought to determine if student achievement could be predicted by a combination of school size and per-pupil expenditures. Student achievement was measured by the percentage of students who scored proficient or advanced on the South Carolina state assessment in grades K-5 (Carpenter, 2006). Using data from the 2004-2005 school year, Carpenter's data was inconclusive. Although Carpenter found little relationship between student achievement and school size, he did conclude from his study "that as schools increase in size, per-pupil operating costs will decline" (p. 86).

Summary

School districts in Missouri receive funding at the local, state, and federal levels. The current state funding formula, SB 287, was described in Chapter 2 as well as how school districts receive local and federal funding. Multiple studies have assessed the validity of SB 287 and a sample of those studies have been highlighted in this chapter. The definition of per-pupil expenditures and professional development per-pupil expenditures in the state of Missouri was reestablished within this chapter as well. There have been a multitude of studies that have addressed the relationship between per-pupil expenditures, professional development per-pupil expenditures, and student achievement with mixed findings. Chapter 3 provides a description of the methodology utilized in the study.

Chapter 3

Methods

The study's primary purpose was to determine the extent to which there is a relationship between total per-pupil expenditures and student achievement. The second purpose was to determine the extent to which there is a relationship between professional development per-pupil expenditures and student achievement. The third purpose of the study was to determine the extent to which student enrollment in a district impacts how total per-pupil expenditures and professional development per-pupil expenditures are related to student achievement. This chapter describes the methodology used to conduct this study and includes the following sections: research design, selection of participants, measurement, data collection procedures, data analysis and hypothesis testing, and limitations.

Research Design

This quantitative study utilized correlational research methods to assess the relationship between variables. Lunenburg and Irby (2008) defined correlational research as analyzing relationships that are "grounded in interactions of one variable to another" (p. 35). This study was conducted using archived data from Missouri Department of Elementary and Secondary Education (DESE) for the 2018-2019 school year. The independent variables measured for this study were the yearly total per-pupil expenditures, professional development per-pupil expenditures, and student enrollment in Missouri K-12 public school districts. The dependent variables measured for this study were district ACT composite scores, graduation rates, and the percentage of students who

scored proficient or advanced on the English language arts and mathematics Missouri Assessment Program assessments.

Selection of Participants

Lunenburg and Irby (2008) described purposive sampling as "selecting a sample based on the researcher's experience or knowledge of the group to be sampled" (p. 175). School districts were chosen for this study based on the following criteria: the school district was a public K-12 school district in the state of Missouri during the 2018-2019 school year. There were 438 K-12 public school districts in the state of Missouri that were utilized in the study. Eight charter schools and nine public schools were removed from the sample due to incomplete data during the 2018-2019 school year.

Measurement

The following subsections outline how each of the independent and dependent variables were measured in the study. The three independent variables are total per-pupil expenditures, professional development per-pupil expenditures, and district student enrollment. The four dependent variables are composite ACT scores, district graduation rate, the percentage of students who scored proficient/advanced on the English language arts MAP assessment Grades 3-12, and the percentage of students who scored proficient/advanced on the mathematics MAP assessment Grades 3-12. The school districts were also disaggregated into four tiers based on district student enrollment.

Total per-pupil expenditures. Total per-pupil expenditures are numerical data that are measured in dollars. School district expenditures are defined by DESE (2019d) as "total instruction and support expenditures in a fiscal year excluding: capital outlay, debt service, community services, non-instruction/support, adult education, and Title I

expenditures" (p. 8). The total amount of district expenditures is divided by the total number of students enrolled in a district to calculate the total per-pupil expenditure for that district.

Professional development per-pupil expenditures. Professional development per-pupil expenditures are numerical data that are measured in dollars. For the purpose of this study, professional development expenditures include expenditures from function codes 2214 (Professional Development) and 2213 (Instructional Staff Training Services) as reported to DESE in the Annual Secretary of the Board Report. The total amount of district professional development expenditures is divided by the total number of students enrolled in a district to configure the total professional development per-pupil expenditures.

District student enrollment. Student enrollment for grades K-12 were utilized in the study. DESE (2019d) defined K-12 enrollments as

> the count of students taken the last Wednesday of September of all students in Grades K through 12 enrolled in a school district or charter school attendance center. Each student (part-time, or full-time) is counted as one. Desegregation transfer students are reported in the enrollment of the district/charter in which they attend school. Students who are enrolled in alternative programs or area career centers are reported in the enrollment of the students' regular school in their home district/charter. (p. 1)

ACT. DESE (2019d) calculated the average composite ACT score by averaging the composite ACT score of all the students enrolled in the school district who had taken

the ACT during 2018-2019 school year. The ACT is the culmination of four multiple-choice tests on four different subjects: Mathematics, Science, English language arts, and Reading (ACT, 2019b). Each section of the ACT consists of a specific number of multiple-choice questions and a specific time-limit. Table 1 displays the number of questions and time-limit for each section of the test.

Table 1

Overview of ACT

Subject	Questions	Time (minutes)
English language arts	75	45
Mathematics	60	60
Reading	40	35
Science	40	35

Note. Adapted from *Preparing for the ACT*, by ACT, 2020, p. 3. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/Preparing-for-the-ACT.pdf.

Table 2 displays the item topics within the four subjects of the ACT. The number of correct answers for each subject are converted into a score ranging from 1 to 36, and the composite score is the average of the scores for all four subjects of the test (ACT, 2019b). Beginning in 2016, students who had already taken the full test were permitted to retake specific sections online during the national testing dates to improve their composite score (ACT, 2020).

Table 2

Subject Categories of the ACT

Subject	Category	Percentage
English	Production of writing	29-32
	Knowledge of language	13-19
	Conventions of standard English	51-56
Mathematics	Preparing for higher mathematics	57-60
	Integrating essential skills modeling	40-43
Reading	Key ideas and details	55-60
	Craft and structure	25-30
	Integration of knowledge & ideas	13-18
Science	Interpretation of data	45-55
	Scientific investigation	20-30
	Evaluation of models, inferences, & experimental results	25-35

Note. Adapted from *Preparing for the ACT*, by ACT, 2020, pp. 7-10. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/Preparing-for-the-ACT.pdf.

The validity and reliability of the ACT is critical as postsecondary institutions often consider students' ACT scores when making admission decisions (ACT, 2008). The ACT (2023a) uses predictive validity and content validity to gain evidence in supporting the validity of the test. Content validity is based in research such as the ACT National Curriculum Survey, academic research, and college and career readiness standards (ACT, 2023b). Predictive validity is empirical data, such as postsecondary course performance data, utilized to determine if the test is reliable in accurately predicting postsecondary performance (ACT, 2023b).

The ACT National Curriculum Survey is conducted by the ACT every three to five years to collect data about "what entering college students should know and be able to do

to be ready for college-level coursework" (ACT, 2023a, para. 11). The ACT (2023b) conducts the survey displaying their "commitment to ensuring not only that the assessments are consistently valid and relevant but also that they provide information enabling students and workers to be fully ready to embark successfully on rewarding college and career journeys" (p. 12). Survey participants include K-12 teachers, college instructors, and a national cross section of workforce supervisors and employees (ACT, 2023b).

While the ACT National Curriculum Survey helps to guide building the assessments, the results of the assessments "validate the ACT College and Career Readiness Standards, as well as the ACT College Readiness Benchmarks" (ACT, 2023a, para. 8). The ACT (2023b) defined College and Career Readiness Standards as "empirically derived descriptions of the essential skills and knowledge students need to become ready for college and career" (p. 70). ACT College Readiness Benchmarks are "ACT scores that represent the level of achievement required for students to have a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in corresponding credit-bearing first-year college courses" (ACT, 2023b, p. 76). Together, the ACT College and Career Readiness Standards and Benchmarks work together to validate that the test measures what ACT purports and that the test is able to predict performance in a reliable way (ACT, 2023a).

The ACT (2008) conducted a study on predicting college success using high school grades and ACT scores as predictors. The data of the study revealed that both ACT scores and high school grades enhance the prediction of college success with ACT carrying greater weight when "an institution wants its admission criteria to reflect the

ultimate level of degree attainment by the end of postsecondary education" (ACT, 2008, p. 2). Huang and Huh(2016) studied the predictive validity of the ACT Composite score and high school GPA jointly to predict a student's first-year college GPA. Huang and Hue (2016) concluded that "a prediction model that uses both ACT composite score and high school GPA is a good model to predict actual college GPA" (p. 6).

Graduation rate. Graduation rate was measured by the percentage of students who graduated high school within four years. Beginning with the class of 2010, the Missouri State Board of Education established 24 units of credit as the minimum graduation requirement (DESE, 2019b). According to DESE (2019b), the minimum graduation requirements were established "to ensure graduates have taken courses that provide them with the essential knowledge, skills, and competencies as identified in the Missouri Learning Standards to be successful after graduation" (p. 6). Table 3 displays the units of credits in each subject area needed to graduate.

Table 3

Missouri Graduation Requirements by Units of Credit

Subject	Units of credit
English language arts	4.0
Mathematics	3.0
Social studies	3.0[a]
Science	3.0
Fine arts	1.0
Physical education	1.0[b]
Practical arts	1.0
Health	0.5
Personal finance	0.5

Note. Adapted from *Graduation Requirements for Students in Missouri Public Schools*, by DESE, 2019, p. 6. Retrieved from https://dese.mo.gov/media/pdf/graduation-requirements.

[a] Passing of the U.S. and Missouri Constitution exam as well as the passing of an American civics exam that is given to all high school students in Missouri.

[b] 30 Minutes of cardiopulmonary resuscitation instruction and training in the proper performance of Heimlich maneuver or other first aid for choking

Along with earning a minimum of 24 units of credit, students must also complete additional requirements. Students must pass four EOC assessments prior to graduation: Algebra I, Biology, English II, and Government (DESE, 2021b). During Grades 9-12, students must pass a test or tests on the U.S. Constitution and the Missouri Constitution (DESE, 2019b). Students must pass an examination of the provisions and principles of American civics during their high school career (DESE, 2019b). Furthermore, during a health or physical education course, students must complete 30 minutes of CPR training and training in the proper performance of the Heimlich maneuver or other first aid to prevent chocking (DESE, 2019b).

Missouri Assessment Program (MAP). MAP grade-level assessments are administered to students in Grades 3 through 8 to meet the needs of state and federal requirements to determine students' progression towards the MAP Standards (DESE, 2019c). MAP grade-level assessments in English language arts and mathematics include selected-response items, short-text items, and technology-enhanced items (DESE, 2019c). There is variation between the English language arts and mathematics MAP assessments. English language arts assessments in Grades 4-8 include a writing prompt whereas mathematics assessments in all grade levels include a performance event (DESE, 2019c). DESE scales MAP scores for Grades 3-8 ranging from 160-650 for English language arts and 185-660 for mathematics (DESE, 2019c). There are four achievement levels that students can earn on a MAP assessment based on their raw score: Advanced, Proficient, Basic, and Below Basic. Table 4 displays the MAP score range for each achievement level.

Table 4

MAP English Language Arts and Mathematics Performance-Level Scale Score Ranges for Third Through Eighth Grade

Subject	Grade	Achievement level scale score			
		Below basic	Basic	Proficient	Advanced
ELA	3	160-330	331-363	364-394	395-560
	4	170-336	337-387	388-418	419-570
	5	210-350	351-402	403-430	431-600
	6	230-370	371-412	413-437	438-620
	7	240-383	384-434	435-455	456-630
	8	250-392	393-442	443-475	476-650
Math	3	185-325	326-361	362-389	390-520
	4	210-357	358-386	387-412	413-540
	5	250-376	377-409	410-434	435-570
	6	260-387	388-416	417-437	438-580
	7	270-393	394-434	435-461	462-600
	8	310-419	420-467	468-505	506-660

Note. ELA = English language arts; Math = mathematics. Adapted from *Missouri Assessment Program Grade-Level Assessments: Guide to Interpreting Results,* by DESE, 2019, pp. 5-13. Retrieved from https://dese.mo.gov/media/pdf/asmt-gl-gir-spring-2019.

According to DESE (2021b), all Missouri high school students must complete EOC assessments in Algebra I, English I, Biology, and Government prior to graduation. Algebra II is a required assessment for students who take the Algebra I EOC prior to high school (DESE, 2021b). Additional EOC assessments that are optional for students to complete are: English II, Geometry, American History, and Physical Science (DESE, 2021b). EOC Assessments may contain the following types of questions: selected response, constructed response, writing tasks, and technology enhanced items (DESE,

2021b). DESE scales EOC scores for English language arts and mathematics starting at 325 and 400 as the threshold of indicating proficient achievement level (DESE, 2019c). There are four achievement levels that students can earn on an EOC assessment based on their raw score: Advanced, Proficient, Basic, and Below Basic. Table 5 displays the EOC's scale score for each achievement level.

Table 5

EOC Performance-Level Descriptors

Subject	Achievement level scale score			
	Below basic	Basic	Proficient	Advanced
Algebra I	325-388	389-399	400-408	409 & higher
Algebra II	325-387	388-399	400-410	411 & higher
Geometry	325-386	387-399	400-413	414 & higher
English I	325-383	384-399	400-414	415 & higher
English II	325-383	384-399	400-419	420 & higher

Note. Adapted from *Guide to Interpreting Results 2018-2019,* by DESE, 2019, pp. 6-19. Retrieved from https://dese.mo.gov/media/pdf/asmt-eoc-gir-1819.

The validity and reliability of the MAP as an assessment of student performance is discussed yearly in two reports published by DESE including the MAP Grade-Level Assessment Technical Report and EOC Assessment Technical Report. The MAP Grade-Level Assessment Technical Report was submitted to DESE by the Data Recognition Corporation (DRC) and the EOC Assessment Technical Report was submitted to DESE by Questar Assessment (Questar). The technical reports are "designed to provide validity evidence to support the use and intended interpretation of the Map Assessments" (DRC, 2019, p. 3).

Students in grades 3 through 8 were tested in English language arts and mathematics and students in grades 5 and 8 were administered the science assessment (DRC, 2019). The grade-level MAP assessments are aligned with the Missouri Learning Standards and the assessments were created by "DRC using DRC's college- and career-ready item bank as well as Missouri-owned items, which were written by Missouri educators" (DRC, 2019, p. 1). Each chapter of the technical report presents validity evidence of each phase of the testing cycle. The DRC (2019) stated "taken together, the sound process for the test development, standardized test administration, reliable scoring of testing items, performance level setting, and the results of the psychometric analyses provide substantial evidence of the validity of the MAP test scores" (p. 17).

According to Questar (2019), the "EOC assessments are standards-based assessments designed to measure students' knowledge of the Missouri Learning Standards, which define the knowledge and skills students need in each grade level and course for success in college, other postsecondary training, and career" (p. 1). The validation process for EOC assessments involved a collection of evidence and is documented throughout the technical report (Questar, 2019). For the 2018-2019 testing cycle, Questar (2019) reported that "post administration test analyses supported the technical quality of the MO EOC assessments. Validity of score inferences is bolstered when test scores are consistent" (p. 98). Although validating the EOC assessments within the technical report, Questar (2019) cautioned "it is critical to remember that the assessment program does not exist in a vacuum; it is not just a test. It is one part of a complex network intended to help school improve student learning" (p. 4).

School district tiers. To determine if school size affected the relationship between per-pupil expenditures and student achievement, Missouri K-12 public school districts were disaggregated into four tiers. The tiers were disaggregated based on the number of students enrolled in each school district during the 2018-2019 school year. Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

Data Collection Procedures

The researcher submitted the Institutional Review Board (IRB) application to Baker University on June 6, 2022. Baker University IRB approved the study on July 1, 2022 (See Appendix A). All publicly accessible data for the study were collected from the DESE website. The following information was collected from each school district's annual report card that is submitted to DESE including: average composite ACT scores, graduation rates, the percentage of students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments, the percentage of students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments, and the student enrollment in the district. Each school district's total per-pupil expenditures and professional development per-pupil expenditures were submitted to DESE in each district's Annual Secretary of the Board Report (DESE, n.d.).

School district data collected from the DESE website were compiled in an Excel spreadsheet for the 2018-2019 school year. School districts were given a non-identifiable label. The statistical package used to analyze the data was IBM SPSS 28.

Data Analysis and Hypotheses Testing

In this study, 16 hypotheses were formulated addressing the 16 research questions presented in Chapter 1. Each hypothesis was tested to find the level of significance between the dependent and independent variables. For hypotheses 1-8, a Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables. For hypotheses 9-16, the numerical data was disaggregated into four tiers based on student enrollment in the district prior to testing. Six Fisher's z tests were conducted for each research question, 9-16, because the differences between four Pearson correlation coefficients were examined.

RQ1. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

***H1*.** There is a relationship between the Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district average composite ACT score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the district average composite ACT score. The statistical significance of the correlation coefficient was examined to test H1. The level of significance was set at .05. The effect size is reported when appropriate.

RQ2. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district graduation rate?

***H2*.** There is a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district graduation rate.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the district graduation rate. The statistical significance of the correlation coefficient was examined to test H2. The level of significance was set at .05. The effect size is reported when appropriate.

RQ3. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

***H3*.** There is a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H3. The level of significance was set at .05. The effect size is reported when appropriate.

RQ4. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

***H4*.** There is a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H4. The level of significance was set at .05. The effect size is reported when appropriate.

RQ5. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

***H5*.** There is a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables:

professional development per-pupil expenditures and the district average composite ACT scores. The statistical significance of the correlation coefficient was examined to test H5. The level of significance was set at .05. The effect size is reported when appropriate.

RQ6. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate?

H6. There is a relationship between the Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the district graduation rate. The statistical significance of the correlation coefficient was examined to test H6. The level of significance was set at .05. The effect size is reported when appropriate.

RQ7. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

H7. There is a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H7. The level of significance was set at .05. The effect size is reported when appropriate.

RQ8. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

***H8*.** There is a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H8. The level of significance was set at .05. The effect size is reported when appropriate.

RQ9. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

***H9*.** There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district average composite ACT score.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the district average composite ACT scores were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ9 because differences between four Pearson correlation coefficients were examined. The level of significance was set at .05. The effect size is reported when appropriate.

RQ10. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district graduation rate?

***H10*.** There is a difference, based district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district graduation rate.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the district graduation rate were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ10 because the

differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

RQ11. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

H11. There is a difference, based district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ11 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

RQ12. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil

expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

H12. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ12 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

RQ13. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

H13. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil

expenditures and student achievement, as measured by the district average composite ACT score.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between instructional professional development per-pupil expenditures and the district average composite ACT scores were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ13 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

RQ14. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate?

***H14*.** There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between professional development per-pupil expenditures and the district graduation rate were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ14 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

RQ15. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12?

***H15*.** There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ15 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

RQ16. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the

percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12?

H16. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ16 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

Limitations

Limitations, according to Lunenburg and Irby (2008), "are factors that may have an effect on the interpretation of the findings or on the generalizability of the results" (p. 133). The potential limitations of this study were the following:

- The graduation requirements varied between school districts in the study.

- Financial information used in the study was submitted to DESE directly by the school districts; therefore, expenditures may vary based on coding differences from district to district.
- Student attendance, motivation, attitude, and physical and emotional health could have impacted student academic achievement and were outside the researcher's control.
- Teaching strategies, preparation, and testing environment for the Missouri Assessment Program assessments varied by school district and were outside the control of the researcher.
- The ACT is not a requirement for students; therefore, the population of students who took the ACT varied from district to district.
- The presentation and implementation of professional development might have varied from district to district and were outside the control of the researcher.

Summary

Chapter 3 consisted of an explanation of methodology utilized in this quantitative study. The researcher analyzed 16 research questions using a correlational research method to assess the relationship between per-pupil expenditures and student achievement. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship. Also, the researcher analyzed a correlational research method to assess the extent that the relationship between per-pupil expenditures and student achievement is different based on district school enrollment. A purposive sample of Missouri public K-12 school districts was utilized in the study. The

measurement, data collection procedures, and limitations were also included within the chapter. The results of the data analyses for the study are presented in Chapter 4.

Chapter 4

Results

The purpose of this quantitative study was to analyze archival school district data collected from DESE to determine the extent to which there is a relationship between total per-pupil expenditures and student achievement. A second purpose was to determine the extent to which there is a relationship between professional development per-pupil expenditures and student achievement. The third purpose of this study was to determine the extent to which the district school enrollment affected the extent that the school districts of Missouri per-pupil expenditures and professional development per-pupil expenditures are related to student achievement. The results of the 16 hypothesis tests to address the 16 research questions are explained in this chapter.

Descriptive Statistics

The sample for this study consisted of 438 Missouri K-12 public school districts The independent variables measured for this study were the yearly total per-pupil expenditures, professional development per-pupil expenditures, and student enrollment in the Missouri K-12 public school districts. The dependent variables measured for this study were average ACT composite scores, graduation rates, and the percentage of students who scored proficient or advanced on the English language arts and mathematics Missouri Assessment Program assessments. Table 6 displays the statistics for all 438 Missouri K-12 public school districts combined.

Table 6

Missouri Public K-12 School Districts Statistics

	Descriptive Statistics				
Variable	*M*	*Mdn*	*S*	*Min*	*Max*
PPE ($)	10,465	9,871	2,075	7,614	21,078
PD PPE ($)	71	58	43	1	411
Enrollment	1,925	693	3,488	73	24,924
ACT	20	20	2	15	26
Graduation	94	94	5	71	100
ELA MAP	48	48	10	15	86
Math MAP	40	40	12	7	83

Note. All numerical values are rounded to the nearest whole number. PPE = Per-pupil expenditures; PD PPE = Professional development per-pupil expenditures; Enrollment = district student enrollment; ACT = ACT composite score; ELA = English language arts; Math = mathematics; MAP = Missouri Assessment Program Assessment.

For hypotheses 9-16, the numerical data was disaggregated into four tiers based on student enrollment prior to testing during the 2018-2019 school year. Tier 1 is comprised of 164 school districts who enrolled fewer than 500 students in their districts. Table 7 displays the statistics for Tier 1 schools.

Table 7

Tier 1 Statistics

	Descriptive Statistics				
Variable	*M*	*Mdn*	*S*	*Min*	*Max*
PPE ($)	11,521	11,952	2,348	1,764	21,078
PD PPE ($)	74	63	43	20	254
Enrollment	279	265	107	73	494
ACT	20	19	2	16	23
Graduation	95	98	6	75	100
ELA MAP	48	47	10	22	86
Math MAP	39	38	13	10	83

Note. All numerical values are rounded to the nearest whole number. PPE = Per-pupil expenditures; PD PPE = Professional development per-pupil expenditures; Enrollment = district student enrollment; ACT = ACT composite score; ELA = English language arts; Math = mathematics; MAP = Missouri Assessment Program Assessment.

Tier 2 contains 111 school districts whose enrollment ranged between 500-1,000 students for the 2018-2019 school year. Table 8 displays the statistics for Tier 2 schools.

Table 8

Tier 2 Statistics

	Descriptive Statistics				
Variable	*M*	*Mdn*	*S*	*Min*	*Max*
PPE ($)	9,551	9,177	1,483	7,642	19,036
PD PPE ($)	60	51	28	20	178
Enrollment	707	693	135	505	985
ACT	20	20	1	16	23
Graduation	94	95	5	79	100
ELA MAP	47	46	9	24	69
Math MAP	39	39	11	9	70

Note. All numerical values are rounded to the nearest whole number. PPE = Per-pupil expenditures; PD PPE = Professional development per-pupil expenditures; Enrollment = district student enrollment; ACT = ACT composite score; ELA = English language arts; Math = mathematics; MAP = Missouri Assessment Program Assessment.

There are 127 school districts in Tier 3 who ranged in enrollment between from 1,001-5,000 students for the 2018-2019 school year. Table 9 displays the statistics for Tier 3 schools.

Table 9

Tier 3 Statistics

	Descriptive Statistics				
Variable	*M*	*Mdn*	*S*	*Min*	*Max*
PPE ($)	9,826	9,496	1,533	7,693	18,016
PD PPE ($)	72	55	44	15	210
Enrollment	2,365	2,056	1,148	1,001	4,947
ACT	20	20	2	15	26
Graduation	93	93	4	78	100
ELA MAP	49	49	9	15	74
Math MAP	42	42	10	7	73

Note. All numerical values are rounded to the nearest whole number. PPE = Per-pupil expenditures; PD PPE = Professional development per-pupil expenditures; Enrollment = district student enrollment; ACT = ACT composite score; ELA = English language arts; Math = mathematics; MAP = Missouri Assessment Program Assessment.

Tier 4 contains the remaining 36 school districts whose number of students enrolled in the school district was larger than 5,000 during the 2018-2019 school year. Table 9 displays the statistics for Tier 4 schools.

Table 10

Tier 4 Descriptive Statistics

	Descriptive Statistics				
Variable	*M*	*Mdn*	*S*	*Min*	*Max*
PPE ($)	10,721	10,290	1,818	8,016	16,288
PD PPE ($)	83	65	72	1	411
Enrollment	11,633	10,466	5,654	5,141	24,924
ACT	21	21	2	15	25
Graduation	90	92	7	71	98
ELA MAP	50	53	15	16	73
Math MAP	44	47	16	9	67

Note. All numerical values are rounded to the nearest whole number. PPE = Per-pupil expenditures; PD PPE = Professional development per-pupil expenditures; Enrollment = district student enrollment; ACT = ACT composite score; ELA = English language arts; Math = mathematics; MAP = Missouri Assessment Program Assessment.

Hypothesis Testing

Sixteen research questions were addressed and sixteen hypotheses were tested in this study. For each of the first eight hypotheses, a Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables. For hypotheses 9-16, the numerical data was disaggregated into four tiers based on student enrollment prior to testing during the 2018-2019 school year. Six Fisher's z tests were conducted on each research question, 9-16, because differences between four Pearson correlation coefficients were examined.

RQ1. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

***H1*.** There is a relationship between the Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district average composite ACT score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the district average composite ACT score. The statistical significance of the correlation coefficient was examined to test H1. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient (r = -.028) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between total per-pupil expenditures and the district average composite ACT score, df = 164, p = .719. H1 was not supported.

RQ2. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district graduation rate?

***H2*.** There is a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the district graduation rate.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the district graduation rate. The statistical significance of the

correlation coefficient was examined to test H2. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient (r = .118) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between total per-pupil expenditures and the district graduation rate, df = 164, p = .131. H2 was not supported.

RQ3. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

***H3*.** There is a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H3. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient (r = -.045) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no

statistically significant relationship between total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12, $df = 164$, $p = .563$. H3 was not supported.

RQ4. To what extent is there a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

***H4*.** There is a relationship between Missouri K-12 public school district total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H4. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient ($r = -.062$) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics

Missouri Assessment Program assessments in Grades 3 through 12, $df = 164$, $p = .429$. H4 was not supported.

RQ5. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

***H5*.** There is a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the district average composite ACT scores. The statistical significance of the correlation coefficient was examined to test H5. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient ($r = .053$) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between professional development per-pupil expenditures and the district average composite ACT scores, $df = 164$, $p = .502$. H5 was not supported.

RQ6. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate?

H6. There is a relationship between the Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the district graduation rate. The statistical significance of the correlation coefficient was examined to test H6. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient (r = .027) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between professional development per-pupil expenditures and the district graduation rate, df = 164, p = .728. H6 was not supported.

RQ7. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

H7. There is a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the percentage of district students

who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation coefficient was examined to test H7. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient (r = -.057) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12, df = 164, p = .470. H7 was not supported.

RQ8. To what extent is there a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

***H8*.** There is a relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the two numerical variables: professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12. The statistical significance of the correlation

coefficient was examined to test H8. The level of significance was set at .05. The effect size is reported when appropriate.

The correlation coefficient (r = -.048) provided evidence for no relationship between the variables. The hypothesis test for the correlation also indicated no statistically significant relationship between professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12, df = 164, p = .542. H8 was not supported.

RQ9. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

H9. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district average composite ACT score.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the district average composite ACT scores were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ9 because differences between the Pearson correlation coefficients were examined. The level of significance was set at .05. The effect size is reported when appropriate.

The differences in the results of the six Fisher's Z comparisons support H9 (see Table 11, p. 69). The difference in the correlation between per-pupil expenditures and

composite ACT scores was significant between Tier 1 and Tier 2 school districts, and between Tier 4 and both Tier 2 and Tier 3 school districts. However, the other three comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and composite ACT scores.

Table 11

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Per-Pupil Expenditures and Student Achievement, as Measured by Composite ACT Scores

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	-.028	.719	164		
Tier 2	.271	.004	111	-2.46	.014
Tier 3	.036	.689	127	-0.54	.589
Tier 4	-.342	.041	36	1.72	.085
Tier 2	.271	.004	111		
Tier 3	.036	.689	127	1.84	.066
Tier 4	-.342	.041	36	3.19	.001
Tier 3	.036	.689	127		
Tier 4	-.342	.041	36	2.00	.046

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ10. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district graduation rate?

H10. There is a difference, based district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the district graduation rate.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the district graduation rate were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ10 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The differences in the results of the six Fisher's Z comparisons support H10 (see Table 12, p. 71). The difference in the correlation between per-pupil expenditures and district graduation rate was significant between Tier 1 and both Tier 3 and Tier 4 school districts, and between Tier 2 and Tier 4 school districts. However, the other three comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and district graduation rate.

Table 12

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Per-Pupil Expenditures and Student Achievement, as Measured by District Graduation Rate

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	.118	.131	164		
Tier 2	.069	.472	111	0.40	.689
Tier 3	-.152	.089	126	2.27	.023
Tier 4	-.405	.014	36	2.87	.004
Tier 2	.069	.472	111		
Tier 3	-.152	.089	126	1.69	.091
Tier 4	-.405	.014	36	2.51	.012
Tier 3	-.152	.089	126		
Tier 4	-.405	.014	36	1.41	.159

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ11. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12?

***H11*.** There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and

student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ11 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The differences in the results of the six Fisher's Z comparisons support H11 (see Table 13, p. 73). The difference in the correlation between per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12 was significant between Tier 1 and Tier 2 school districts, and between Tier 2 and both Tier 3 and Tier 4 school districts. However, the other three comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

Table 13

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Per-Pupil Expenditures and Student Achievement, as Measured by the Percentage of Students Who Scored Proficient or Advanced on the English Language Arts MAP Assessments

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	-.045	.563	164		
Tier 2	.228	.016	111	-2.23	.026
Tier 3	.053	.556	127	-0.82	.412
Tier 4	-.348	.037	36	1.66	.097
Tier 2	.228	.016	111		
Tier 3	.053	.556	127	1.36	.174
Tier 4	-.348	.037	36	2.99	.003
Tier 3	.053	.556	127		
Tier 4	-.348	.037	36	2.12	.034

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ12. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12?

H12. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school total per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between total per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ12 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The differences in the results of the six Fisher's Z comparisons support H12 (see Table 14, p. 75). The difference in the correlation between per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12 was significant between Tier 1 and Tier 2 school districts, and between Tier 2 and Tier 4 school districts. However, the other three comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and the percentage of district students who scored proficient or advanced on the Mathematics Missouri Assessment Program assessments in Grades 3 through 12.

Table 14

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Per-Pupil Expenditures and Student Achievement, as Measured by the Percentage of Students Who Scored Proficient or Advanced on the Mathematics MAP Assessments

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	-.062	.429	164		
Tier 2	.231	.015	111	-2.39	.017
Tier 3	.059	.512	127	-1.01	.313
Tier 4	-.301	.074	36	1.30	.194
Tier 2	.231	.015	111		
Tier 3	.059	.512	127	1.34	.180
Tier 4	-.301	.074	36	2.74	.006
Tier 3	.059	.512	127		
Tier 4	-.301	.074	36	1.89	.059

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ13. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district average composite ACT score?

***H13*.** There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil

expenditures and student achievement, as measured by the district average composite ACT score.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between instructional professional development per-pupil expenditures and the district average composite ACT scores were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ13 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The evidence for no differences in the results of the six Fisher's Z comparisons does not support H13 (see Table 15, p. 77). The six comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and composite ACT scores.

Table 15

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Professional Development Per-Pupil Expenditures and Student Achievement, as Measured by composite ACT Scores

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment[a]	*r*	*p*	*n*	*z*	*p*
Tier 1	.053	.502	164		
Tier 2	-.174	.069	111	1.84	.066
Tier 3	-.094	.294	127	1.23	.219
Tier 4	-.285	.092	36	1.81	.070
Tier 2	-.174	.069	111		
Tier 3	-.094	.294	127	-0.62	.535
Tier 4	-.285	.092	36	0.59	.555
Tier 3	-.094	.294	127		
Tier 4	-.285	.092	36	1.02	.308

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ14. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate?

H14. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the district graduation rate.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between professional development per-pupil expenditures and the district graduation rate were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ14 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The evidence for no differences in the results of the six Fisher's Z comparisons does not support H14 (see Table 16, p. 79). The six comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and district graduation rate.

Table 16

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Professional Development Per-Pupil Expenditures and Student Achievement, as Measured by District Graduation Rate

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	.027	.728	164		
Tier 2	-.023	.813	111	0.40	.689
Tier 3	-.195	.028	126	1.87	.062
Tier 4	-.231	.175	36	1.37	.171
Tier 2	-.023	.813	111		
Tier 3	-.195	.028	126	1.32	.187
Tier 4	-.231	.175	36	1.07	.285
Tier 3	-.195	.028	126		
Tier 4	-.231	.175	36	0.19	.849

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ15. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12?

H15. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil

expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ15 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The differences in the results of the six Fisher's Z comparisons does not support H15 (see Table 17, p. 81). The six comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program assessments in Grades 3 through 12.

Table 17

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Professional Development Per-Pupil Expenditures and Student Achievement, as Measured by the Percentage of District Students who Scored Proficient or Advanced on the English Language Arts Missouri Assessment Program Assessments in Grades 3 Through 12

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	-.057	.470	164		
Tier 2	-.026	.785	111	-0.25	.803
Tier 3	-.119	.184	127	0.52	.603
Tier 4	-.277	.101	36	1.19	.234
Tier 2	-.026	.785	111		
Tier 3	-.119	.184	127	0.71	.478
Tier 4	-.277	.101	36	1.30	.194
Tier 3	-.119	.184	127		
Tier 4	-.277	.101	36	0.84	.201

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

RQ16. To what extent is there a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12?

H16. There is a difference, based on district student enrollment (Tier 1-Tier 4), in the relationship between Missouri K-12 public school professional development per-pupil expenditures and student achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12.

Prior to the hypothesis testing, the numerical data was disaggregated by district student enrollment. Four correlations between professional development per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments in Grades 3 through 12 were calculated for school districts classified as Tier 1, Tier 2, Tier 3, and Tier 4. Six Fisher's z tests were conducted to address RQ16 because the differences between four Pearson correlation coefficients were examined. The four sample correlations were compared. The level of significance was set at .05. The effect size is reported when appropriate.

The differences in the results of the six Fisher's Z comparisons does not support H16 (see Table 18, p. 83). The six comparisons between districts based on size reflected no differences in the relationship between per-pupil expenditures and the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program assessments in Grades 3 through 12.

Table 18

Differences, Based on District Student Enrollment, in the Relationship Between Missouri K-12 Public School Professional Development Per-Pupil Expenditures and Student Achievement, as Measured by the Percentage of District Students who Scored Proficient or Advanced on the Mathematics Missouri Assessment Program Assessments in Grades 3 Through 12

	Subgroup correlations		Fisher's *z* statistics		
Student enrollment [a]	*r*	*p*	*n*	*z*	*p*
Tier 1	-.048	.542	164		
Tier 2	-.023	.808	111	-0.20	.842
Tier 3	-.076	.396	127	0.24	.810
Tier 4	-.271	.110	36	1.20	.230
Tier 2	-.023	.808	111		
Tier 3	-.076	.396	127	0.40	.689
Tier 4	-.271	.110	36	1.28	.201
Tier 3	-.076	.396	127		
Tier 4	-.271	.110	36	1.03	.303

[a] Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students).

Additional Analyses

In addition to addressing the research questions by testing the hypotheses, the researcher analyzed the strength and direction of the relationships between per-pupil expenditures/professional development per-pupil expenditures and student achievement by calculating the correlations at each of the four tiers of district student enrollment. The

paired comparisons that were part of the hypothesis testing between student enrollment levels prompted the researcher's interest in the individual correlations for districts of different sizes. The results of the Fisher's Z comparisons indicated seven correlations that were statistically significant when the data for per-pupil expenditures/professional development per-pupil expenditures and student achievement were disaggregated by student enrollment.

When the data for per-pupil expenditures and academic achievement, as measured by ACT, were disaggregated by enrollment level, two of the correlations were statistically significant (see Table 11, pg. 69). The moderately strong positive correlation using the data for school districts with a student enrollment of 501-1,000 was statistically significant, $r = .271$, $df = 111$, $p = .004$. Strong evidence from the analysis of this correlation indicates that if a school district with a student enrollment of 501-1,000 increased per-pupil expenditures, there is a moderately high probability that the district's ACT composite scores would increase as well. The moderately strong negative correlation using data from school districts with a student enrollment of more than 5,000 was statistically significant, $r = -.342.$, $df = 36$, $p = .041$. Strong evidence from the data indicates that if a school district with a student enrollment of more than 5,000 increased per-pupil expenditures, there is a high probability that the district's ACT scores would decrease. The correlations for school districts with fewer than 500 students and enrollments of 1,000-5,000 students were not significant.

When the data for per-pupil expenditures and academic achievement, as measured by graduation rate, were disaggregated by enrollment level, one of the correlations was statistically significant (see Table 12, p. 71). The moderately strong negative correlation

using data from school districts with a student enrollment of more than 5,000 was statistically significant, $r = -.405$, $df = 36$, $p = .014$. Evidence from the analysis of the correlation indicates that if a school district with a student enrollment of more than 5,000 increased per-pupil expenditures, there is a moderately probability that the district's graduation rate would decrease. The correlations for school districts with fewer than 500, 501-1,000, and 1,000-5,000 students were not significant.

When the data for per-pupil expenditures and academic achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments, were disaggregated by enrollment level, two of the correlations were statistically significant (see Table 13, p. 73). The moderately strong positive correlation using data from school districts with a student enrollment of 501-1,000 was statistically significant, $r = .228$, $df = 111$, $p = .016$. Evidence from the analysis of the correlation indicates that if a school district with a student enrollment of 501-1,000 increased per-pupil expenditures, there is a somewhat high probability that the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments would increase. The moderately strong negative correlation using data from school districts with a student enrollment of more than 5,000 was statistically significant, $r = -.348$, $df = 36$, $p = .037$. Strong evidence from the data indicates that if a school district with a student enrollment of more than 5,000 increased per-pupil expenditures, there is a somewhat high probability that the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments would decrease. The

correlations for school districts with fewer than 500 and 1,000-5,000 students were not significant.

When the data for per-pupil expenditures and academic achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments, were disaggregated by enrollment level, one of the correlations was statistically significant (see Table 15, p. 75). The moderately strong positive correlation using data from school districts with a student enrollment of 501-1,000 was statistically significant, $r = .231$, $df = 111$, $p = .015$. Evidence from the analysis of the correlation indicates that if a school district with a student enrollment of 501-1,000 increased per-pupil expenditures, there is a high probability that the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments would increase. The correlations for school districts with fewer than 500, 1,000-5,000, and greater than 5,000 students were not significant.

When the data for professional development per-pupil expenditures and academic achievement, as measured by graduation rate, were disaggregated by enrollment level, one of the correlations was statistically significant (see Table 16, p. 79). The moderately strong negative correlation using data from school districts with a student enrollment of 1,000-5,000 was statistically significant, $r = -.195$, $df = 126$, $p = .028$. Moderately strong evidence from the data indicates that if a school district with a student enrollment of 1,000-5,000 increased professional development per-pupil expenditures, there is a high probability that the district's graduation rate would decrease. The correlations for school

districts with fewer than 500, 501-1,000, and greater than 5,000 students were not significant.

Summary

The hypotheses testing indicated no statistically significant relationships between the independent variables, per-pupil expenditures or professional development per-pupil expenditures and the dependent variables measuring student achievement, district ACT composite scores, graduation rates, and the percentage of students who scored proficient or advanced on the English language arts and mathematics Missouri Assessment Program assessments. When the school districts were disaggregated into four tiers based on enrollment, the data indicated six statistically significant relationships between per-pupil expenditures and student achievement. In contrast, when the school districts were disaggregated into four tiers based on enrollment, the data indicated only one statistically significant relationship between professional development per-pupil expenditures and student achievement. The hypotheses testing supported the null hypotheses that there is a difference, based on district student enrollment, in the relationship between per-pupil expenditures and student achievement. In contrast, the hypotheses testing did not support the null hypotheses that there is a difference, based on district student enrollment, in the relationship between professional development, per-pupil expenditures, and student achievement.

Chapter 5

Interpretation and Recommendations

The focus of this study was to determine if there is a relationship between per-pupil expenditures or professional development per-pupil expenditures, and the following measurements of student achievement: district ACT composite scores, graduation rates, and the percentage of students who scored proficient or advanced on the English language arts and mathematics Missouri Assessment Program assessments. Additionally, the study focused on how district student enrollment affected the relationship between per-pupil expenditures, professional development per-pupil expenditures, and student achievement. Chapter 5 is discussed in three main sections: study summary, findings related to the literature, and conclusions.

Study Summary

This section contains a summary of the current study, which examined the relationship between per-pupil expenditures and professional development per-pupil expenditures and student achievement. Included in the study summary is an overview of the problem followed by the purpose statement and research questions. Lastly, a review of the methodology is presented along with an explanation of the major findings.

Overview of the problem. There have been multiple studies addressing the relationship between per-pupil expenditures and student achievement, yet there has been a wide variety of results. Chapter 2 provides evidence of a number of studies with conflicting results with no clear indication if per-pupil expenditures have a positive or negative relationship with student achievement. Sander's (2017) study found that spending has a positive relationship with student achievement whereas Brazeale's (2014)

study indicated a negative relationship between the variables. Hubner (2022) went as far as to conclude, “Money does matter in the state of New Hampshire” (p. 129).

Similar to mixed results that have been produced when examining the relationship between per-pupil expenditures and student achievement, there are conflicting results when addressing the relationship between professional development per-pupil expenditures and student achievement. In addition, researchers such as Dalton (2010) and Cooper (2022) conducted studies with conflicting results within their respected studies when the dependent variables were disaggregated by subject.

Contradictory results have indicated the need for additional research to be conducted to address the relationship between per-pupil expenditures, professional development per-pupil expenditures, and student achievement. The shortage of studies conducted in Missouri has also led to a need for additional research to be conducted. Lastly, there is a lack of evidence to address how district student enrollment impacts the relationship between per-pupil expenditures, professional development per-pupil expenditures, and student achievement

Purpose statement and research questions. The purpose of the quantitative study was to analyze archival school district data collected from the DESE to determine the extent to which there is a relationship between total per-pupil expenditures and student achievement. A second purpose was to determine the extent to which there is a relationship between professional development per-pupil expenditures and student achievement. The third purpose of the study was to determine the degree to which district student enrollment affected the extent that the school districts per-pupil expenditures and professional development per-pupil expenditures are related to student

achievement. To address the purpose of this study, 16 research questions were posed and 16 hypotheses were tested.

Review of the methodology. This quantitative study included correlational research methods to assess the relationship between variables. This study was conducted using archived data from DESE for the 2018-2019 school year. The independent variables measured for this study were the yearly total per-pupil expenditures, professional development per-pupil expenditures, and the student enrollment in Missouri K-12 public school districts. Student enrollment was disaggregated into four tiers based on district student enrollment: Tier 1 (≤500 students), Tier 2 (501-1,000 students), Tier 3 (1,001-5,000 students), and Tier 4 (≥5,000 students). The dependent variables measured for this study were district ACT composite scores, graduation rates, and the percentage of students who scored proficient or advanced on the English language arts and mathematics Missouri Assessment Program assessments. Eight Pearson product moment correlation coefficients were calculated to index the strength and direction of the relationship between the independent and dependent variables in hypotheses 1-8. For hypotheses 9-16, six Fisher's z tests were conducted on each hypothesis to examine the differences between four Pearson correlation coefficients based on district enrollment.

Major findings. This study's researcher examined data from 438 public K-12 school districts in Missouri from the 2018-2019 school year. The researcher sought to examine the relationship between total per-pupil expenditures, professional development per-pupil expenditures, and student achievement. Research questions 1-8 and hypotheses 1-8 addressed the relationship. The researcher examined how the relationship was affected by district student enrollment. After addressing the 16 research questions and

testing the 16 hypotheses, additional analysis was reported on the strength and direction of the relationships between per-pupil expenditures/professional development per-pupil expenditures and student achievement by calculating the correlations at each of the four tiers of district student enrollment. The hypotheses testing indicated no statistically significant relationship between per-pupil expenditures or professional development per-pupil expenditures and any of the measures of student achievement. Hypotheses 1-8 were not supported. The hypothesis testing supported the hypotheses that there is a difference, based on district student enrollment, in the relationship between per-pupil expenditures and student achievement. As a result, hypotheses 9-12 were supported. In contrast, when the school districts were disaggregated into four tiers based on enrollment, the data indicated no statistically significant relationship between professional development per-pupil expenditures and student achievement. Hypotheses 13-16 were not supported.

When the researcher disaggregated the data for the additional analyses into four tiers based on enrollment, the data indicated six statistically significant relationships between per-pupil expenditures and student achievement. When the data for per-pupil expenditures and academic achievement, as measured by ACT, were disaggregated by enrollment level, two of the correlations were statistically significant. The moderately strong positive correlation using the data for school districts with a student enrollment of 501-1,000 (Tier 2) was statistically significant and the moderately strong negative correlation using data from school districts with a student enrollment of more than 5,000 (Tier 4) was statistically significant. When the data for per-pupil expenditures and academic achievement, as measured by graduation rate, were disaggregated by

enrollment level, one of the correlations was statistically significant. The moderately strong negative correlation using data from school districts with a student enrollment of more than 5,000 (Tier 4) was statistically significant. When the data for per-pupil expenditures and academic achievement, as measured by the percentage of district students who scored proficient or advanced on the English language arts Missouri Assessment Program Assessments, were disaggregated by enrollment level, two of the correlations were statistically significant. The moderately strong positive correlation using data from school districts with a student enrollment of 501-1,000 (Tier 2) was statistically significant as well as the moderately strong negative correlation using data from school districts with a student enrollment of more than 5,000 (Tier 4). When the data for per-pupil expenditures and academic achievement, as measured by the percentage of district students who scored proficient or advanced on the mathematics Missouri Assessment Program Assessments, were disaggregated by enrollment level, one of the correlations was statistically significant. The moderately strong positive correlation using data from school districts with a student enrollment of 501-1,000 (Tier 2) was statistically significant. When the school districts were disaggregated into four tiers based on enrollment, the data indicated only one statistically significant relationship between professional development per-pupil expenditures and student achievement. A statistically significant relationship was identified when the data for professional development per-pupil expenditures and academic achievement, as measured by graduation rate, were disaggregated by enrollment level. The moderately strong negative correlation using data from school districts with a student enrollment of 1,000-5,000 (Tier 3) was statistically significant.

Findings Related to the Literature

The findings of the current study related to the literature on the impact of per-pupil expenditures, professional development per-pupil expenditures and student achievement are found in this section. As a whole without disaggregating the data based on district student enrollment, the findings of this study indicate that there is no relationship between per-pupil expenditures and student achievement, as measured by the following indicators: district ACT composite scores, district graduation rate, percentage of students who scored proficient/advanced on English language arts Missouri Assessment Program Assessments, and percentage of students who scored proficient/advanced on mathematics Missouri Assessment Program Assessments. The study's findings align with those of Irvin's (2017) who also found no relationship between per-pupil expenditures and student achievement, as measured by district ACT scores and district graduation rate.

Although an overview of the current study indicated no relationship between per-pupil expenditures and student achievement, the researcher did find positive and negative relationships when Missouri school districts were disaggregated into four tiers based on district student enrollment. The data indicated positive relationships between per-pupil expenditures and student achievement, as measured by ACT composite scores, the percentage of students who scored proficient/advanced on English language arts Missouri Assessment Program Assessments, and the percentage of students who scored proficient/advanced on mathematics Missouri Assessment Program Assessments, in Tier 2 school districts. School districts in Tier 2 have a student enrollment of 501-1,000

students. Goins (2015), Sander (2017), and Hubner (2022) found similar positive relationships between per-pupil expenditures and student achievement. The results of the analysis indicated negative relationships between per-pupil expenditures and student achievement, as measured by ACT composite scores, graduation rate, and the percentage of students who scored proficient/advanced on English language arts Missouri Assessment Program Assessments, and percentage of students who scored proficient/advanced on mathematics Missouri Assessment Program Assessments, in Tier 4 school districts. School district in Tier 4 have a student enrollment of greater than 5,000 students. These negative relationships align with studies reviewed in Chapter 2 (Brazeale, 2014; Lodmel, 2015; Case, 2016;, Potutsching, 2019; Shupe, 2019; Martin, 2020).

The findings of the current study indicated no relationship between professional development per-pupil expenditures and student achievement. This aligns with studies conducted by Johnston (2013) and Bryant (2018) who also found no relationship between professional development per-pupil expenditures and student achievement when measured by student outcomes on statewide student assessments. Cooper (2022) found no relationship between professional development per-pupil expenditures and student achievement, when measured by the percentage of students who scored proficient/advanced on mathematics Missouri Assessment Program Assessments

The current study indicated mixed results when Missouri school districts were disaggregated into four tiers based on district student enrollment. Overall, one definitive relationship could not be identified as the results varied based on the district student enrollment and the variables that were tested. A negative relationship was found between

professional development per-pupil expenditures and student achievement, as measured by district graduation rate, in Tier 4 school districts. School districts in Tier 4 have a student enrollment of greater than 5,000 students. The current findings of Tier 4 do not support the findings of Durbin (2018) who concluded that larger district achieve higher academic achievement while lowering per-pupil expenditures. In contrast, the study indicated a positive relationship in Tier 2 school districts between per-pupil expenditures and student achievement, as measured by composite ACT scores, the percentage of students who scored proficient/advanced on English language arts MAP assessments, and the percentage of students who scored proficient/advanced on mathematics MAP assessments. School districts in Tier 2 have a student enrollment of 501-1,000 students. These findings align with Goins (2015) who found a positive relationship between per-pupil expenditures and ACT scores as well as Hubner (2022) who found a positive relationship between per-pupil expenditures and English language arts state assessments.

Conclusions

Conclusions drawn from the current study regarding the relationship between per-pupil expenditures, professional development per-pupil expenditures, and student achievement are presented in this section. In addition, conclusions from this study about the degree to which district student enrollment affected the extent that the school districts per-pupil expenditures and professional development per-pupil expenditures are related to student achievement can be found in this section. This section contains the following subheadings: implications for action, recommendations for future research, and concluding remarks.

Implications for action. The results of this study can be used by public school districts in Missouri during the financial decision-making process. The data has indicated the student achievement has no relationship with per-pupil expenditures and professional development per-pupil expenditures. This aligns with Martin's (2020) statement, "The reality is that spending a per-pupil dollar amount does not mean that each pupil will achieve at the same level" (p. 131). The discoveries of this study align with the findings in Roberts' (2002) study that concluded that increases in per-pupil expenditures produce an increase in student achievement.

The results of this study are not to discourage school leaders from using financial resources in hopes of improving student achievement. Instead, it is meant to caution school leaders in the belief that simply increasing expenditures will guarantee positive results. School leaders can use this study in their journey to be good stewards of district finances and understand the complexities that come with improving student achievement.

When school districts were disaggregated by student enrollment, the results of the study did indicate that in school districts with a student enrollment of 501-1,000 students, per-pupil expenditures do have a positive relationship with student achievement. The results could be used to identify school districts who have shown to have a positive relationship between per-pupil expenditures and student achievement. This sub-group of districts could provide insight on their financial strategies and assist other districts in improving student achievement.

Recommendations for future research. The seven recommendations for continued and futured research are as follows:

- This study was conducted over one school year. It is recommended that the study be replicated for a longer period of time beyond just one school year to gain access to longer trendlines.
- Similar to the initial recommendation, it is suggested that a longitudinal study be conducted that follows a specific cohort of students over multiple school years and reviews their performances on the Missouri Assessment Program assessments. The study would only track expenditures that are directly related to the cohort to further test the hypothesis that per-pupil expenditures have a relationship with student achievement.
- The current study involved results from the 2018-2019 school year, which was prior to the COVID-19 Pandemic that began in 2020. It is recommended that the study be replicated using post 2020 school data to investigate the impact COVID-19 Pandemic has had on our educational community.
- The current study used total per-pupil expenditures and professional development expenditures as independent variables. It is recommended that the study be replicated using instructional per-pupil expenditures to determine if the results vary.
- Per-pupil expenditures encompass all Fund One expenditures which includes a large number of ancillary expenditures, such as expenditures on activities and athletics, that have no direct impact on student academic

achievement. School district leaders could benefit if the current study was replicated, yet removing all non-academic expenditures.

- When the school districts were disaggregated into four tiers based on their enrollment, the relationship between expenditures and student achievement varied, based on student enrolment. Based on these results, it is recommended to conduct a mixed-methods study analyzing variables that led to districts with a student enrollment of 501-1,000 having a strong positive relationship between per-pupil expenditures and ACT composite scores, yet districts with a student enrollment larger than 5,000 having a strong negative relationship.
- The current researcher disaggregated school districts into four tiers based on student enrollment. It is recommended that the study be replicated with the school districts disaggregated by urban, suburban, and rural designation.

Concluding remarks. The researcher who conducted this study sought to detect if there is a relationship between per-pupil expenditures, professional development per-pupil expenditures, and student achievement. Previous researchers have sought to identify a relationship using a variety of variables to represent student achievement, as outlined in Chapter 2. The data from the research indicated that, regardless of the variable that was used to represent student achievement, no meaningful relationship was found between the variables. District leaders must not focus on solely increasing expenditures in hopes of increasing student achievement. Leaders must find balance

between financial capital and human capital while placing a greater emphasis on the educators in their respected buildings.

As educators seek to effectively and efficiently improve student performance, a multitude of budgeting and pedagogical strategies must be considered. There are no simple solutions when it comes to improving student achievement, more research is needed to establish the correlation between per-pupil expenditures and student achievement. As evidenced by the literature review and this study, researchers have not reached consensus on the correlation between per-pupil expenditures and student achievement. Therefore, educators must continue to explore all avenues to effectively manage district resources while promoting the academic success of all students, as cost-effective research continues.

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Appendix

Appendix A: IRB Approval Letter

BAKER UNIVERSITY
Own Confidence

Baker University Institutional Review Board

July 1st, 2022

Dear Bryon Cecil and Denis Yoder,

The Baker University IRB has reviewed your project application and approved this project under Exempt Status Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

Please be aware of the following:

1. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
2. Notify the IRB about any new investigators not named in original application.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents of the research activity.
4. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.
5. If the results of the research are used to prepare papers for publication or oral presentation at professional conferences, manuscripts or abstracts are requested for IRB as part of the project record.
6. If this project is not completed within a year, you must renew IRB approval.

If you have any questions, please contact me at npoell@bakeru.edu or 785.594.4582.

Sincerely,

Nathan Poell, MLS
Chair, Baker University IRB

Baker University IRB Committee
Sara Crump, PhD
Nick Harris, MS
Susan Rogers, PhD