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The Association Between School Spending And Academic Growth Among Seventh Grade Students In Michigan

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THE ASSOCIATION BETWEEN SCHOOL SPENDING AND ACADEMIC GROWTH AMONG SEVENTH GRADE STUDENTS IN MICHIGAN

by

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DEDICATION

This dissertation is dedicated to my husband, Melvin D. Jack, whose unwavering support and countless hours of sacrifice provided me with the fuel necessary to complete my journey in pursuit of the Ph.D. degree.

Also, to my mother, Dr. JoAnn Springer Thomas, who modeled for me what prayer, preparation, and perseverance looks like, sounds like, and feels like.

Lastly, to my father, James H. Thomas, Jr., whose memory, and faith in my ability to reach my goals shall live forever in my heart.

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I can do all things through Christ who strengthens me.
- Philippians 4:13

Foremost, I thank God for the passion and gift to live according to His purpose and plan.

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CHAPTER 1: INTRODUCTION

Failure to sufficiently invest in high-quality public education for all children has significant consequences for both students and society as a whole (Hinojosa, 2018). The association between school-level spending and student achievement has been the focus of extensive research. For decades, economists and educational scholars have studied the impact of school spending on student academic proficiency (Baker, 2017). Findings from the previous research on the effects of school spending are, at best, inconclusive, leaving policymakers and practitioners struggling to understand how school spending benefits student academic outcomes (Henry et al., 2010). A growing consensus is there is a positive relationship between increased levels of school funding and improved student outcomes (Rebell, 2017). Given the empirical evidence that student academic performance in the United States is plagued with stagnated progress and achievement gaps (NCES, 2021), scholarly discussion on identifying a relationship between school funding and student outcomes have expanded to understanding how school funding is used to improve student outcomes (Baker et al., 2020). Understanding the relationship between resource allocation and student outcomes in this era of school accountability is critically necessary.

Background

A focus on educational investment has been demonstrated in Michigan through state finance reform efforts. The education finance system in Michigan has undergone ambitious reform by way of funding equalization (Courant & Loeb, 1997; Delpier et al., 2019; Papke, 2005) through the passage of Proposal A (Courant & Loeb, 1997). Proposal A was passed in 1994 and called for local property taxes and state sales taxes to be used as revenue sources to fund Michigan's public schools (Arsen et al., 2019). The goal of school funding equalization associated with Proposal A in Michigan was twofold: (a) to centralize K-12 school finance while eliminating local property

tax as the primary source of school revenue and (b) to decrease school funding disparities across state districts (Arsen et al., 2019). While this ambitious reform narrowed spending disparities by increasing per-pupil allocation in the state's lowest spending districts, it failed to eliminate spending gaps (Arsen et al., 2019). For example, Arsen et al. (2019) reported three quarters of all school districts received approximately the same foundation funding per pupil, while the remaining districts received slightly more. The highest income districts were reported to earn about 60% more per student than the lowest funded districts (Arsen et al., 2019). Nevertheless, the most notable feature of the state's school finance reform was in the years following this change, the vast majority of school students would have access to expanded educational opportunities (Courant & Loeb, 1997).

The benefits of equalizing school funding in Michigan have been noted in the research literature. For example, Papke (2005) examined the effects of school spending on student performance in Michigan. Papke (2005) reported a statistically significant effect on rates of passing math test scores from 1992-1998, with the greatest effects found in Michigan's lowest performing school districts. The statistical significance in Papke (2005) was related to higher passing rates. This data suggested the equalization of school funding was related to higher academic performance on standardized test in Michigan. However, alternate viewpoints on the effects of school finance reform in Michigan also emerged.

While spending equalization has been a striking feature of school finance reform in Michigan, debate over its benefits remains (Davis et al., 2016). For example, Hoxby (2001) argued equalization in school finance could have leveling-down effects, as greater spending equality could also decrease the average amount of per-pupil spending. However, Lafortune et al. (2018) found school finance reform enacted after 1990 resulted in timely and lasting increases in spending,

particularly in low-income districts. School finance reform that resulted in tax and expenditure limits was significantly related to lower student outcomes in mathematics (Davis et al., 2016; Downes & Figlio, 1998; Hoxby, 2001). These findings indicated contentious benefits of spending equalization as a school finance reform mechanism. Nevertheless, such policy instruments are important in addressing funding and academic inequities (Lafortune et al., 2018).

The aim of equalizing per-pupil expenditures in Michigan was to level the playing field and decrease spending disparities (Arsen et al., 2019). The new school spending structure nearly equalized increases in annual per-pupil allocations for a majority of Michigan school districts (Arsen et al., 2019). According to 2018-2019 school finance data from the state's senate fiscal agency, 84% of traditional and charter public schools receive nearly $8,000 in per-pupil allocation (Michigan Senate Fiscal Agency, 2020). The report further indicated the remaining 16% of districts were either above the minimum ($7,871) but below the basic allocation ($8,489). These outcomes speak to Michigan policymakers' attempts to provide more equitable support to diverse school districts.

Problem Statement

The demand for improved student academic performance in the United States has led to a wave of education reform efforts. For nearly a century, reform efforts have resulted in significant changes in school finance systems at the state level (Arsen et al., 2019). Despite attempts at education finance reform, the academic performance of public school students remains a growing concern. According to the 2019 National Assessment of Educational Progress (NAEP), over 50% of tested students across all grade levels failed to perform at or above proficiency in reading and mathematics (NCES, 2021). These data have changed slightly over the past decade (NCES, 2019). The general problem is that while per-pupil spending has risen substantially over the years, the

academic performance of K-12 public school students has not yielded the same result (Deming & Figlio, 2016). The link between spending and outcomes has been a long-standing topic of debate (Jackson, 2020a). Failing to understand how school spending relates to student academic outcomes may result in long-lasting educational and societal concerns.

There is a growing consensus in education that increases in school spending can improve student academic outcomes (Baker, 2017). The specific problem is that school finance reform in Michigan has failed to yield consistent improvement in student outcomes, particularly at the middle grade level. In the 2018-2019 school year, an estimated $13 billion was spent on K-12 public education in Michigan (Summers, 2019), yet over 50% of seventh grade students failed to demonstrate average growth in mathematics and English Language Arts (ELA) on the statewide assessment (Michigan's Center for Educational Performance and Information, 2021). A recent movement toward school accountability and transparency has placed a greater focus on academic growth-based metrics as an outcome measure of student learning and collecting and reporting school site-level financial data. The results of this study examining the association between school spending and student outcomes could lead to a more significant discussion on improving the academic performance of middle grade students in Michigan.

Purpose Statement

The purpose of this quantitative ex-post facto research study was twofold: (1) to investigate the association between school-level spending and student academic growth through the lens of Open Systems Theory (OST) and (2) to identify the student and school-level characteristics mediating the relationship between school-level spending and student academic growth.

Research Question

The following research question was addressed in this study:

Is school-level per-pupil spending associated with student academic growth in mathematics and ELA among seventh grade students in Michigan, as measured by the 2018-2019 Michigan Student Test of Educational Progress (M-STEP) statewide assessment?

To answer the research question guiding this study, three outcome measures were identified: (a) average student growth percentile, (b) percentage of students with average growth, and (c) percentage of students with below average growth on the 2018-2019 M-STEP statewide assessment. An analysis was conducted to explore this association based on student sociodemographics such as race/ethnicity, socioeconomic status, and special education designation, and school-level structural characteristics such as grade-level configuration, school type, and total site-level enrollment.

While many studies have examined the association between school spending and student academic outcomes (Hanushek, 1986; Hedges et al., 2016; Jackson & Mackevicius, 2021; Plecki, 2000), research on the effects of financial resources on student academic growth as an achievement measure is greatly limited. This study aimed to address this gap in the educational literature by examining the association between school-level spending and its effects on student academic growth instead of academic proficiency. This study has implications for practice as the focus on school improvement remains a top priority in Michigan.

Significance of the Study

The limited focus in research on the intersection between school-level spending and student academic performance among middle grade students warrants greater attention. While many studies have examined the association between school spending and student academic outcomes (Hanushek, 1986; Hedges et al., 2016; Jackson & Mackevicius, 2021; Plecki, 2000), research is

sparse on the effects of fiscal resources on student academic growth as an achievement measure. A plausible rationale for this scarcity is, under the Every Student Succeeds Act (ESSA) of 2015, school accountability legislation has recently required educational leaders to examine student academic outcomes using growth-based measures and within student subgroups and publicly report school-level expenditures (Cook-Harvey et al., 2016).

The most significant influence on student learning occurs at the school level (Darling-Hammond, 2004; Leithwood & Riehl, 2003). Understanding how student and school-level characteristics are related to student academic achievement is salient to school reform efforts. This is especially important as the historical underperformance observed among middle grade students continue in Michigan and even nationally. Examining school spending allows for a more intensive study of funding effects on student academic performance (Atchison et al., 2017). As such, results from this study may contribute to existing literature by offering a viable approach to examining school funding associations in K-12 public school education.

Definition of Key Terms

The following definitions are provided to ensure uniformity and understanding of the terms for the purpose of this study.

Academic Growth. Academic growth is a change in student learning over time within the same student (Anderman et al., 2015).

Academic Growth Model. The academic growth model is a statistical model for quantitatively summarizing an individual student's or groups of students' academic performance over two or more points in time (Goldschmidt et al., 2012).

Fiscal Resource Allocation. Fiscal resource allocations are decisions made regarding the assignment of budgetary resources in a strategic way to meet desired outcomes (Picus, 2004).

Middle School. Middle schools are school sites typically made up of Grades 6-8 or 5-8 (Rockoff & Lockwood, 2010).

School Accountability. School accountability is the process of evaluating school performance based on student academic performance measures (Figlio & Loeb, 2011).

School-Level. School-level is an individual primary, intermediate, or secondary school building located in a specific geographical area within the defined boundaries of a school district (U.S. Department of Education, 2016).

Student Growth. Student growth refers to students meeting or exceeding adequate growth expectations (Michigan Center for Educational Performance and Information, 2021).

Subgroups. Subgroups are a group of students possessing similar characteristics (Michigan Center for Educational Performance and Information, 2021).

Limitations

The following limitations may impact generalizability of research study findings:

- Secondary data sources were used.
- The researcher could not account for the accuracy and consistency in the datasets.
- The researcher was unable to report a more detailed analysis of how school-level expenditures are allocated categorically.

Delimitations

The following delimitations are made to define the scope of the research. The items excluded from the study are:

- Achievement data reflective of multiple school years
- Factors other than school spending that may impact student educational outcomes
- Student data from states other than Michigan

- Achievement data reflective of the core subjects of science and social studies

Theoretical Framework

Within the school accountability context, there is justification for understanding how individual school sites interact with their broader environment to influence student educational outcomes. In the United States, this interaction can be observed through school accountability policy. A common approach to school improvement has been to hold schools responsible for the academic performance of students through legislated policy (Hanushek & Raymond, 2005). The recent policy environment under the ESSA legislation seeks to hold schools accountable for student outcomes by enacting transparent financial and performance reporting mandates (U.S. Department of Education, 2016). For example, school districts are required to report per-pupil expenditure data at the school site-level (U.S. Department of Education, 2018), enabling the school community and the broader community at large to glimpse into the relationship between government funding and student learning (Cook-Harvey et al., 2016). While there are many examples of how schools interact with the environment, current school accountability legislation illuminates this interaction and provides a plausible example of how schools function as open systems.

Open Systems Theory

OST is the theoretical framework guiding this research study. In 1966, Katz and Kahn brought OST, a concept adapted from general systems theory (von Bertalanffy, 1972), into organizational studies (as cited in Banathy & Jenlink, 2003). Ludwig von Bertalanffy (1968) first introduced systems theory to the field of science in the mid-20th century and contended OST is a worldview or paradigm rather than a theory restricted to a particular discipline. The research has suggested von Bertalanffy's (1968) view continues to hold firmly, as OST has been applied to

understand organizational behavior in education. (Bastedo, 2004). The OST allows for an examination of how inputs (e.g., school fiscal resources), throughputs (e.g., site-level design), and outputs (e.g., student academic performance) are related in efforts to reach organizational goals.

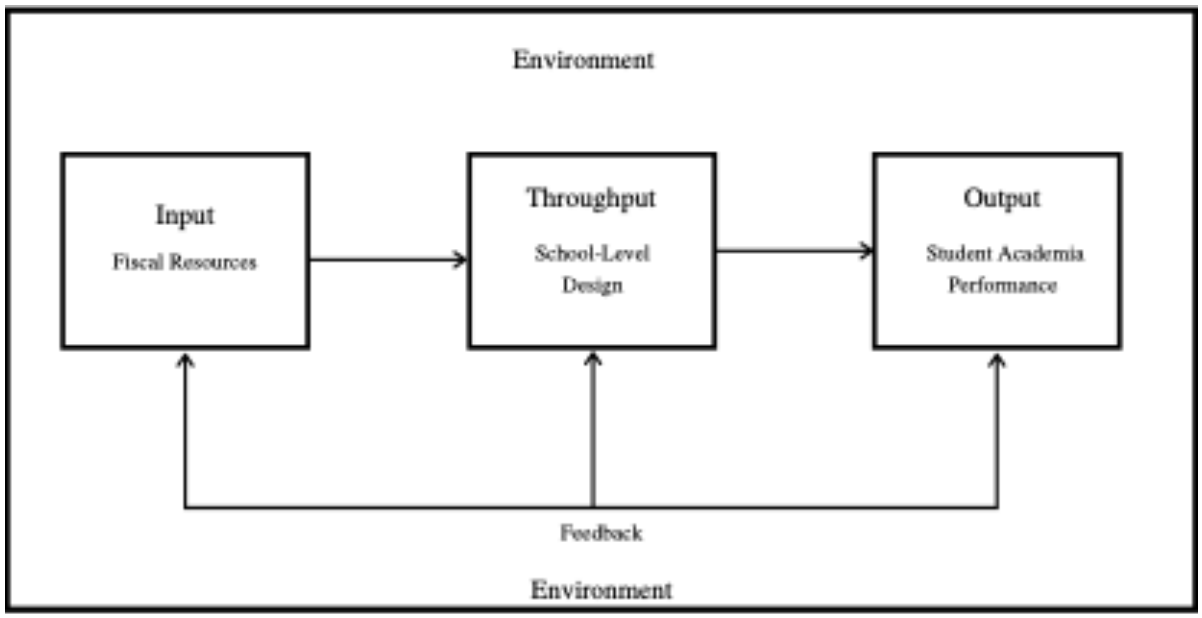
OST allows for an examination of the relationship between organizations and the world in which they operate (Mele et al., 2010). In considering how individual school sites are nested within broader educational systems (e.g., district, state, and national levels), it makes sense to refer to schools as open systems (Bastedo, 2004). Schools are microcosms of the larger external educational systems in which they function and are influenced (Daly & Finnigan, 2010). This research study will draw upon OST to explain how schools interact with and are influenced by their external environment.

Several themes have emerged from the research on the interconnectedness between individual school sites and their external environment. These themes include: (1) dependence on funding streams, (2) school-level design to support student achievement, (3) school accountability rewards or consequences based on student academic performance, and (4) transparency in the reporting of school expenditures and student academic performance through federal and state policy mandates (Lunenburg, 2010; Scott et al., 2007). These interactions between school and environment align with the key components of the Lunenburg (2010) open systems model: inputs, transformation process, outputs, feedback, and the environment. While the Lunenburg (2010) model denotes the conversion of inputs into outputs as the transformation process, the transformation process will be referred to as “throughputs” for the purposes of this study. This change in terminology is accepted in education as throughputs has been used to describe how schools transform inputs based on student and school-level characteristics (Hansen, 1994). Given

the complex interaction between schools and the broader external environment, the OST is an appropriate framework with which to underpin this research study.

Figure 1

OST Applied in Education, Adapted from Lunenburg (2010) Open Systems Model



Note. This model depicts the key components that explain how individual school sites function as an open system and how the external environment is situated within the school's broader context.

This research study will draw upon Lunenburg's (2010) conceptual model to explain how schools can function as open systems. Each component of the open system and their relationship to the school site level are presented. The elements of the open systems model help situate the context of this research study.

Input

OST acknowledges organizations as social systems interconnected to their external environments for resources (Daly & Flannigan, 2010). These environmental resources have generally been classified as human, financial, and capital resources (Lunenburg, 2010). Human resources in schools are the instructional and noninstructional staff who provide the organization's

skills and labor. Financial resources are the money acquired from multiple funding streams and allocated to support school-level operations and educational programming. Capital resources are the facilities, materials, and supply capital used to support operations and programming.

Throughput

OST acknowledges organizations as social systems interconnected to their external environments in the throughput of knowledge (Scott et al., 2007). Throughputs are explicitly concerned with internal operations and information flow (Lunenburg, 2010). In the throughput of information, organizations use feedback to strategically alter its structures or processes to adjust to environmental demand (Bekerom et al., 2017). For example, in the school context at the operational level, central office leaders facilitate knowledge dissemination with school leaders to translate demands into goal attainment (Bekerom et al., 2017). The translation of demands into goals (i.e., throughput) may lead to school site-level restructuring based on student characteristics such as adolescent learners (Rockoff & Lockwood, 2010) or site-level governance structures such as charter school start up (Zimmer et al., 2003). School-level design (e.g., grade-level configuration, charter, and noncharter school type) is a method in which schools disseminate information through an open systems lens (Lipitz & West, 2006).

Output

OST acknowledges organizations as social systems interconnected to their external environments through student academic performance. The association between school inputs and outputs has garnered broad research attention (Hanushek, 1986, 2006; Hedges, 2016). There remains no clear answer on the impact of financial resources on student academic outcomes. However, school leaders are charged with making strategic resource allocation decisions. The

external environment in which schools function and are influenced should view student academic performance results as desirable.

Feedback

Feedback is another way in which schools, as open systems, are interconnected with their external environment. Lunenburg (2010) noted, "feedback is crucial to the success of the school operation" (p. 3). Feedback from the external community to schools offers school-level leaders a plausible pathway for addressing perceived problems. Feedback may manifest itself through multiple environments. These environments may include political, economic, and research arenas.

Environment

Finally, OST acknowledges organizations as social systems interconnected with their external environments through its interaction with federal and state school accountability mandates. The external policy environment influences organizations due to their dependency on knowledge, status, and funding (Spain, 2016). Relevant to this research study is the environmental interaction with school funding. For example, education finance advocates have sought legal action to address concerns on education funding inequities and inadequacies (Lafortune et al., 2018). Researchers in the education community continue to investigate the link between financial resources and student learning.

The political process may be another means for understanding a school's environmental interaction with broader systems. Elected officials may benefit from accessing student academic data from school accountability platforms (e.g., public national and state-level school data platforms) for political interpretation and use. To accomplish this, candidates often campaign to correct problems with the educational system (Henry, 1996). This is important to the research study because the political process is where policy is formed. The legislated policies may impact

education financing and ultimately determine fiscal resource allocation and use at the school level. The political process may also lead to federal and state mandates that impact key areas at the school level, such as curriculum, special education, and teacher certification requirements.

In conclusion, systems theory acknowledges organizations as social systems interconnected to their external environments (Katz & Kahn, 1966). Environmental interactions between the state government and local, state, and federal educational agencies are critically necessary given the school accountability context. The responsibilities of these governmental agencies, within the education context, provide the basis for understanding how the agencies resources and feedback impact school operations related to site-level inputs, throughputs (processes), and outputs. The research supports the importance of considering interactions between school and environment through a systems lens. As such, schools as open systems are salient to this research investigation.

Organization of the Study

This dissertation is organized into five chapters. Chapter 1 provides a background of the study, the purpose and associated research question, significance of the study, definition of terms, limitations, delimitations, and theoretical framework. Chapter 2 presents a comprehensive review of related literature. Chapter 3 reviews the methods that will be used to collect and analyze the collected data. Chapter 4 presents the results of the data analysis used to describe the sample and address the research question. Finally, Chapter 5 includes a discussion of the findings, implications for practice, and suggestions for further research.

CHAPTER 2: LITERATURE REVIEW

This chapter begins with a discussion of academic performance among middle school students. Second, this chapter discusses the education production function theory and a summary of the research literature on how money is related to student outcomes. Next, a review of research on educational spending relative to student and school-level characteristics are presented. The chapter concludes with a discussion of the policy environment, specifically the legislative approaches to school accountability and its effects on student academic outcomes.

Middle Grade Student Academic Performance

There is evidence that public school students' experiences in middle school are related to decreased academic achievement (Clark et al., 2013; Malone et al., 2020). For at least a century, students' academic performance in middle school has been criticized (Clark et al., 2013). Middle school grades in the United States generally include sixth, seventh, and eighth grades (Malone et al., 2018). From an academic achievement point of view, criticism centers on the historical declines observed in reading and mathematics (Schwerdt & West, 2013). Causal factors contributing to the academic decline of middle school students have been subject to extensive discussion in the research literature.

Consequently, two key bodies of research have emerged. First, studies on the effects of grade-level configuration on student academic outcomes during the middle school experience suggested site-level organization may play a role in the academic performance of middle school students (Clark et al., 2013). Second, a related body of literature has suggested the school-to-school transition between elementary and middle school affects student academic performance in adolescent learners (Malaspina & Rimm-Kaufman, 2008). A relevant but limited body of research has illuminated the link between financial resources across various grade-level configurations and

student academic outcomes in middle school. The evidence has shown little support that financial resources is associated with student achievement across different grade-level designs (Rockoff & Lockwood, 2010).

Grade-Level Configuration

Concern about middle school grade-level configuration sparked public criticism in the 1990s after eighth grade students tested poorly on national and international assessments in reading and mathematics (Clark et al., 2013). Criticism grew stronger throughout the years following the No Child Left Behind (NCLB; 2001) legislation. Clark et al. (2013) reported traditionally configured middle schools were once described as "the great disaster of the education system" and the place where "student academic achievement goes to die" (p. 2). Education can be viewed as a cumulative process; thus, student learning that occurred in the previous school years (e.g., sixth and seventh grade) likely impacted the poor academic performance of eighth grade students. Hence, the traditional middle school configuration of sixth, seventh, and eighth grades has been called into question (Byrnes & Ruby, 2007).

Despite the harsh criticism about education production in middle school, the effects of grade-level configuration on student academic outcomes remain an emerging area of research. Although limited, prior studies have aimed to determine the best grade-level configuration to boost the academic achievement of middle school students. These studies have suggested school site grade-level configuration is linked to declines in student learning during middle school (Malaspina & Rimm-Kaufman, 2008; Rockoff & Lockwood, 2010; Schwerdt & West, 2013). The research of Clark et al. (2013) and Malone et al. (2020) have supported these findings, who found seventh grade pass rates on the standardized test were significantly higher in elementary schools than middle schools. This evidence showed seventh grade students performed better based on school

grade-level configuration. These results are intriguing as current school accountability legislation has heightened focus on school-level characteristics, encouraging educational leaders and policymakers to attend more to this area.

Another pair of studies has garnered considerable attention related to grade-level configuration and student academic outcomes. Two extensive longitudinal studies were conducted using city and state-level data. Evidence from the studies revealed statistically significant differences in the academic achievement of seventh grade students who remained in elementary buildings and those who transitioned to middle school buildings in sixth or seventh grade (Rockoff & Lockwood, 2010; Schwerdt & West, 2013). Specifically, researchers found that the academic performance of seventh grade students dropped when transitioned to middle school buildings (Rockoff & Lockwood, 2010; Schwerdt & West, 2013). Findings from these studies support the argument that seventh grade students perform better in school settings that combine elementary and middle school grades.

The methodological approach used in the Rockoff and Lockwood (2010) and Schwerdt and West (2013) studies differ from the method used in this research study. Specifically, both studies focused on student-level effects such as gender rather than school-level outcomes that will be the focus of this study. Moreover, these studies did not explore how student sociodemographics may have impacted performance levels. The role sociodemographics play in student academic performance is well documented in the research literature (Malone, 2020). Nonetheless, Rockoff and Lockwood's (2010) and Schwerdt and West's (2013) results illustrated the significant impact of school-level characteristics on adolescent learners.

School Transition During the Middle Grades

A closely related area highlighted in the research literature is the effect of school transition on academic performance for students entering middle school. Specifically, declines in reading and mathematics achievement among sixth and seventh grade adolescents have been observed during the transition from elementary school to middle school (Alspaugh, 1998). For example, Rockoff and Lockwood (2010) found student transition from elementary to middle school resulted in significant declines in English and mathematics in sixth and seventh grade. Based on a large study of over 44,000 students attending schools in the southern United States, sixth grade students entering middle school demonstrated lower academic performance than students who remained in elementary school (Malone et al., 2020).

Although a statistically significant correlation between grade-level configuration and student academic outcomes during middle school is broadly represented in the existing research literature, other factors may influence academic decline in adolescents. Lack of student motivation, negative attitudes, and behavioral patterns have been identified as common factors impacting students' academic performance in the middle school years (Anderman & Maehr, 1994). It is important to note the school-to-school transition between elementary and middle schools may serve as a catalyst for these common factors. As such, it could be argued that grade-level configuration remains a key school-level input that influences education production throughout the middle school experience (Malaspina & Rimm-Kaufman, 2008).

Per-Pupil Spending and Grade-Level Configuration

Research studies examining the relationship between grade-level configuration, student academic outcomes, and per-pupil spending is sparse (Rockoff & Lockwood, 2010). One reason for this is the great debate on the relationship between school spending and student academic

outcomes has historically dominated educational research. Although research is limited, one previous study shed light on the intersection between grade-level configuration, student academic outcomes, and per-pupil spending. Rockoff and Lockwood (2010) examined the impact of grade-level configuration in public schools. Specifically, the study addressed the financial resources available in schools based on varying grade-level composition and their effect on student achievement. Rockoff and Lockwood (2010) found per-pupil expenditures were nearly the same in K-5 and 6-8 schools, while per-pupil spending, on average, was lower in K-6 than 7-8 configured schools. Yet, student academic performance was better among students attending elementary-middle (e.g., K-8) configured schools. These findings suggested grade-level configuration is a stronger predictor of academic performance than per-pupil spending.

In conclusion, students' academic performance in middle school has garnered significant attention over the years. Yet, school reform related to the adolescent learner remains an area of focus. The vast amount of literature devoted to examining student academic performance during middle school denotes the importance of this topic. Research findings have suggested grade-level configuration strongly influences the academic performance of middle school students.

While these findings are key to improving the academic outcomes of adolescent learners, it is important to note the focus on grade-level configuration presented in this study does not replace the significance of effective classroom instruction as noted in the research literature. Effective classroom instruction has been found to significantly impact student academic outcomes (Leithwood & Riehl, 2003). As such, the focus on school grade-level organization should be coupled with a focus on high-quality classroom instruction to improve the educational outcomes of middle school students. The next section discusses theory on education production and how school spending impacts student academic outcomes.

Education Production Function

Analysis from education production function studies has ignited considerable debate for decades. The goal of education production function analyses is to apply statistical methodology to quantitative data to link school inputs (e.g., money) to student academic performance (Hanushek, 1989). Education production function theory has served as the primary lens for examining the relationship between funding and student academic performance (Hanushek, 1989, 2007; Jackson, 2020b), although inconsistent findings across studies regarding the relationship between school funding and academic performance remain.

The lack of consensus on the relationship between funding and student outcomes has led to two competing arguments: school spending is not related to student academic outcomes and school spending is related to student academic outcomes (Baker, 2017; Della Sala et al., 2017; Hedges et al., 2016). Although several important factors contribute to these competing viewpoints, methodological approaches and data quality have been broadly identified in the research literature as potential culprits for inconsistent findings (Hedges et al., 2016). For example, Delpier et al. (2019) posited school spending positively impacted student academic performance and argued early education production function studies failed to employ rigorous statistical techniques, resulting in skewed research findings. Moreover, Delpier et al. (2019) argued data collected in the early education production function studies have overlooked important variables (e.g., variation within states) related to students or schools. Hedges et al. (2016) made a similar point and argued findings from early education production function studies lacked generalizability due to questionable methodology approaches and data quality. However, Hanushek et al. (1996), who argued there is no consistent statistical relationship between school spending and student academic performance, provided an alternative view to the positions of Delpier et al. (2019) and Hedges et

al. (2016). Hanushek et al. (1996) indicated statistically significant associations between school spending and student academic performance (those represented in contemporary research studies) increase based on the level at which school characteristics are aggregated, thus increasing omitted variable bias. These competing viewpoints about education production function methodology likely contribute to the remaining uncertainty about the effects of school spending on student academic outcomes.

Examination of the association between school spending and student academic performance is rooted in methodological complexity. While research findings remain inconclusive on the extent to which there is a relationship between funding and academic performance, a growing body of research supports the notion that not only is there a relationship, but how money is used drives that relationship (Baker, 2017; Jackson et al., 2016). Historical and contemporary education production function studies are likely signaling a need for greater consistency in research methodological approaches when examining this topic, using high quality datasets and investigations that specifically focus on how money is related to the production of student outcomes. This research study provided information that encompasses each of these elements. The following section highlights how school spending is related to student academic outcomes based on racial, economic, and academic characteristics.

The Cost of Educational Performance

Human Resource Investment

Financial investments in human resources can help improve student academic performance. Human resources are an essential element in the educational system (Greenwald et al., 1996). Roughly 80% of the school districts' budgets across the United States is allocated to human resources (Roza et al., 2004). Three key reports indicated investing in human resources,

specifically teacher capital, was instrumental in producing positive student outcomes (Baker, 2017; Cohen & Hill, 2000; Figlio, 1997). For example, essential human resource investments have included: (1) increasing teacher salary to attract and retain high quality personnel, (2) hiring more teachers to enable smaller class sizes, and (3) investing in teacher instructional capacity through professional development opportunities. These human resources investments are salient given the impact of teacher behavior on student academic outcomes (Rockoff, 2004). For example, there is uncertainty in the research community on the qualifications teachers should possess and how they should obtain them (Darling-Hammond, 2004). However, there is consensus on the importance of having qualified teachers in the classroom to support student learning (Pil & Leana, 2009; Rockoff, 2004). Additionally, teachers' opportunities to engage in professional learning is salient to school improvement efforts, given that professional learning impacts classroom behavior, which influences students' academic performance (Cohen & Hill, 2000).

While financial investments in human capital have been reported as playing an integral role in producing positive student academic outcomes, there remains significant debate about the impact of these investments on student academic performance (Hanushek, 2016; Odden & Picus, 2019). For example, Hanushek (2016) reported the way teacher salary is determined (e.g., number of years teaching, number of degrees obtained) was unrelated to student outcomes in the United States. The notion of reducing class size to positively impact student academic performance has also been an area of debate. For example, Odden and Picus (2019) posited a reduction in class size minimally affected student academic outcomes and was cost ineffective. These studies have shown financial investments in human capital require strategic considerations.

The idea of investing in human resources (e.g., teacher capital) is critical to consider given the role teachers play in classroom instruction (Miles & Frank, 2008). While district and school

context should be taken into careful consideration for financial investment decisions, strategically investing in human capital is strongly supported as a productive allocative decision toward school improvement.

Capital Resource Investment

Financial investment in capital resources at the school site-level has emerged as a point of interest when examining the association between school spending and student academic outcomes. Capital resource investment, defined as financial expenditures geared toward the school infrastructure, construction, and repairs (Crampton, 2009), account for approximately $70 billion per year in school expenditures (Hong & Zimmer, 2016). While researchers' understanding of the impact of capital investments on student achievement is still developing, two recent studies using data from Michigan found capital resources investment positively impacted student achievement (Crampton, 2009; Hong & Zimmer, 2016). Both quantitative studies provided promising but varying insights into the impact of capital investments on student academic outcomes. For example, Crampton (2009) investigated the association between school spending and student academic outcomes using new construction, renovation, and facility maintenance as the independent variables but did not identify the percentage of school site-level expenditures allocated to these investments. Using a regression discontinuity design (RDD), Hong and Zimmer (2016) focused on narrowly passed and failed bond referendums to estimate the effects of capital investment on student academic outcomes in Michigan. Hong and Zimmer (2016) found that capital investments could have long-term effects on student achievement. While an intersection of interest exists in this area, the cost-benefit of a bond referendum in school districts remains unclear. It is important to note the impact of capital investments on student academic outcomes is

strengthened when considered alongside human resource investment, such as instructional support (Crampton, 2009).

Tying it all Together

The impact of school spending on student academic outcomes may depend broadly on resource allocation decisions. More recent literature has provided greater insight into how money is related to student academic outcomes (Jackson, 2020b). For example, financial investments in both human resources and capital resources have been linked to increased student academic outcomes (Baker, 2017; Crampton, 2009; Hanushek, 2016; Hong & Zimmer, 2016). It is plausible to contend students are likely to engage more in educational environments deemed a comfortable place to learn (Condron & Roscigno, 2003). For practitioners and policymakers, this means the allocation of fiscal resources plan an important role improving student academic outcomes. However, budget allocation decisions are likely even more important. Federal and state school accountability policy has ignited the need to examine school site-level expenditures (Every Student Succeeds Act, 2015). This study may provide answers on how school spending is related to student academic outcomes in Michigan schools, in what particular context, and for which groups of students. The next section examines the relationship based on sociodemographics.

Educational Spending and Student Characteristics

Race/Ethnicity

Academic outcomes for racial/ethnic student minority groups remain a concern. On average, historically marginalized populations perform at lower levels than their White peers on standardized assessments (Gigliotti & Sorenson, 2018; Hanushek & Rivkin, 2009). As such, there is a heightened need to examine school resources based on student subgroups. Examining spending patterns among student subgroups is pertinent to understanding opportunity gaps that exist among

these groups (Sosina & Weather, 2019). Recent studies have provided greater insight into how school spending affects student academic outcomes according to race/ethnicity. Jackson (2020a) cited on average, a $1,000 cut in per-pupil allocation can increase the achievement gap between Black and White students by nearly 6%. This effect is comparable to Gigliotti and Sorenson's (2018) findings, who studied variation in per-pupil allocation in New York schools and found increases in student achievement in reading and math was correlated with a $1,000 increase in school spending. Additional studies have found less money is spent to educate students in schools that serve high concentrations of Black and Hispanic students (Baker et al., 2020; Sosina & Weather, 2019). For example, Baker et al. (2020) found the larger the district's Hispanic student population, the more revenue decreased in those districts compared to districts serving fewer Hispanic students. Yet, evidence of the achievement gap between students of color and their White peers in reading and mathematics has been consistently highlighted in the research literature. That is, achievement is less favorable for students of color (Baker et al., 2020; Kuhfeld et al., 2018).

While increases in school spending have been consistently cited in the literature as necessary for closing the achievement gap between racial/ethnic student groups, this claim remains controversial. Bifulco (2005) and Hanushek (1994) agreed increases in school spending may not necessarily translate to improved student academic outcomes. Bifulco (2005) contended although per-pupil expenditures in the average Black districts surpassed the average White districts since 1987, the average academic performance of Black students remains lower than their White peers. While Bifulco (2005) found school spending has been higher in Black districts for the past 30 years, Baker et al. (2020) cited a $23 billion difference among predominantly Black and White districts in school spending, such that less was spent on school districts serving predominately black students. These studies have shown while increases and decreases in school spending have

occurred over time, closing the racial achievement gap in the United States will likely require a more systemic examination that considers environmental factors that expand the economic side of school reform.

Economically Disadvantaged

The academic achievement gap between economically disadvantaged students and their economically advantaged peers has been a long-standing problem in the United States (Dynarski & Kainz, 2015). Despite decades of federal and state policy established to address this issue, disparities remain (Jackson et al., 2016). The per-pupil allocation of school resources has been cited as having the greatest effect on economically disadvantaged students (Gigliotti & Sorenson, 2018). That is, greater allocation of fiscal resources, on average, can lead to increased academic performance among economically disadvantaged students. The funding disparities between low- and high-spending districts have sparked school finance reform across the country (Lafortune et al., 2018). In Michigan, for example, an overhaul of its state school finance system intended to equalize school spending occurred in 1994 with the passage of Proposal A (Arsen et al., 2019; Papke, 2005). The Proposal A policy allowed for a funding increase to low-spending districts (Papke, 2005) that generally represent a larger number of economically disadvantaged students (Sosina & Weather, 2019). This is important because equalization of school spending may result in closing the achievement gap, regardless of socioeconomic status or family background (Baker et al., 2020; Card & Payne, 2002). Yet, with school funding equalization occurring across the country, the achievement gap between economically disadvantaged students and their economically advantaged peers continues.

While the context of this research study is situated around school spending at the state and local levels, it is important to highlight the role of federal funding when examining school spending

and its effects on economically disadvantaged students. Federal funding is critical to this discussion because the goal of these funds (e.g., Title I) is to provide supplementary expenditures to support reading and mathematics among economically disadvantaged students who attend low-income public schools (van der Klaauw, 2008). Although many districts have access to more educational dollars through federal funding streams to support economically disadvantaged students, debate on the effectiveness of additional funds on student academic outcomes persists. For example, Borman and D'Agostino (1996) and Mullin and Summers (1983) found while Title I funds had a minimal positive effect on standardized test scores, they did not successfully close the achievement gap between economically disadvantaged students and their noneconomically disadvantaged peers (van der Klaauw, 2008). While this finding is noteworthy, other factors may mask the impact of federal funds (i.e., Title I funds) on economically disadvantaged students' academic achievement. These factors include: (1) the limited amount of total federal spending to support K-12 education, (2) states and cities choosing to forego available federal Title I funds, and (3) mixed reports on the link between school spending and student academic outcomes (van der Klaauw, 2008).

While there is consensus on the importance of access to high quality education for economically disadvantaged students, the role school funding plays in maximizing the academic outcomes of these students remains inconclusive. A promising path toward evaluating the impact of school funding on academic outcomes of economically disadvantaged students would be to assess its impact based on students' academic growth (van der Klaauw, 2008). It would be beneficial to know whether economically disadvantaged students made progress over time given the school resources available. This study attempted to contribute to the literature by addressing this gap.

Special Student Populations

Improving academic outcomes among student subgroups, such as special education (SE) students and English language learners (ELLs), is a school accountability policy priority in the United States. Special education students and ELLs represent a significant student subgroup population who inhabit diverse instructional needs (Chambers et al., 2003; Horsford & Sampson, 2013). It can be challenging to identify school expenditures allocated to support the academic needs of special population subgroups (Ferguson & Ladd, 1996). However, two influential cost-analysis reports shed light on the expenditures associated with educating special education students and ELLs (Chambers et al., 2003; Slama, 2014). As a part of a special education expenditure report conducted for the Center for Special Education Finance (CSEF), Chambers et al. (2003) found per-pupil education expenditures varied by disability category, such that expenditures were nearly 2 times greater than spending for nonspecial education students. This is significant because although per-pupil expenditures for special education students are greater on average, special education programs positively impact the achievement of students receiving special education services on average (Hanushek, 2003). In Michigan, the issue over how special education is funded was illuminated in an influential report from Arsen et al. (2019). Recent educational spending analyses indicated inequitable and inadequate funding for special education in Michigan (Arsen et al., 2019). The underlying reason for this disparity is funding is mostly handled at the local and county levels. There are also limitations in generating additional revenue per state education policy (Arsen et al., 2019). Nevertheless, local school districts remain obligated to meet special education federal and state requirements.

There is an underrepresentation in the research literature on what works and how much funding adequately educates ELLs (Horsford & Sampson, 2013). However, one influential study

focused specifically on ELLs. Slama (2014) sought to identify whether and when ELLs exited language learning programs and found ELLs left these programs in the early grades but returned in later grades (e.g., middle and high school). As such, teacher capital is a pivotal expense for educating ELLs (Horsford & Sampson, 2013). The conflict between instructional priorities and fiscal and human resources available to support ELLs may be one plausible explanation for why students returned to language learning programs (Sugarman, 2016). Nevertheless, this finding is extremely relevant to the discussion of school funding because the longer students remain in language learning programs, the higher the school expense (Sugarman, 2016).

These informative studies have suggested school spending (i.e., both traditional public and charter schools) plays a vital role in meeting the diverse needs of special education students and ELLs. Human or teacher capital is one of the most significant expenses for teachers to impact student academic performance (Greenwald et al., 1996; Hanushek, 2016). It is important for local and state education agencies to examine data among student subgroups to ensure equitable, adequate, and accessible funding pathways exist to support diverse student needs. Taken in tandem, these studies have shown the link between school spending and academic achievement among student subgroups remains incredibly important despite decades of school finance reform and school accountability policy to address these issues. The researcher examined school spending patterns outlined in federal and state school accountability policy among these student subgroups to expand existing literature.

Educational Spending and School-Level Characteristics

The school finance and spending patterns of charter and traditional public schools are key areas to discuss in this research study. As a school reform mechanism, charter schools are one of the most highly debated topics in the United States (Miron & Urschel, 2010). This debate is rooted

in school choice policies that many believe ignite competition, particularly in student enrollment, between traditional public school and charter public-school academies (Arsen & Ni, 2012a). In Michigan, the debate around school finance has garnered significant attention. Michigan schools, including charter schools, are almost exclusively funded based on the number of students enrolled (Arsen & Ni, 2012a). As charter schools create competition with traditional public schools for student enrollment, particularly in urban and low-income suburban communities, the operating revenue of traditional public schools is likely to decrease in these areas due to charter schools' availability (Arsen & Ni, 2012a). For example, the former Detroit public schools district lost nearly one third of its student population, resulting in a revenue loss of approximately $400 million (Reckhow & Thiel, 2017). A decrease in school revenue in urban, low-income suburban school districts is salient to this discussion because on average, these school districts serve students with the greatest needs. It is important to note while school funding in the educational system is allocated according to the school size, charter schools are more likely to have lower per-pupil funding, underlining the differences in spending between charter schools and traditional public schools.

Another key area to discuss in this research study is differences in school spending patterns between charter and traditional public schools. Findings from three pivotal studies revealed charter schools spend less on instructional services (e.g., teacher salaries, after-school programs) and special education and more on administrative costs (Izraeli & Murphy, 2012; Miron & Urschel, 2010; Nelson et al., 2003). Nelson et al. (2003) also found while charter schools are free to spend flexibly, they often spend a higher share on administration than instruction compared to the traditional setting. Conversely, Arsen and Ni (2012b) found charter schools, on average, spend more on building supervision and security because of the school's urban setting.

Various attempts have been made to reform the educational system within the United States. One notable aspect of these reform attempts is the charter school movement. These findings suggested there are differences in what traditional public schools and charter public-school academies offer, such that traditional public schools generally offer more programs. As such, funding and spending patterns are contingent upon school enrollment size and the range of services offered. While there is diverse literature on the two public school systems, it is challenging to access comparable data on charter school finances (Miron & Urschel, 2010). However, systemic differences in spending patterns and student outcomes between charter and traditional public schools are visible.

The Policy Environment

Approaches to School Accountability

Federal school accountability policy serves as an instrument to drive public school reform in the United States. In general, accountability policy aims to keep educational institutions accountable for student results through various results-based instruments, such as performance ratings and specific incentives and penalties (Deming & Figlio, 2016). Through federally mandated school accountability policies like the NCLB Act of 2001 and the ESSA of 2015, an intense focus has been placed on the academic performance of all students and student subgroups (Egalite et al., 2017). Educational spending has also remained a primary area of focus (Dee et al., 2013). Although controversy has ensued over the past several decades on the approach to school accountability, the push for more robust school reform has remained of significant public interest (Deming & Figlio, 2016). Further, school accountability, particularly as a policy instrument, guides educational and political goals around schooling in the United States (Mehta, 2013). The enactment of ESSA has demonstrated evidence of the country's continued commitment to

bolstering student academic outcomes, reducing educational inequities, and highlighting educational spending. The enactment of ESSA put in place key mechanisms for addressing school reform relative to school resource reporting and student academic performance.

ESSA and Transparency in School Spending

Transparency in school site-level spending has emerged alongside student academic performance under the ESSA school accountability policy. ESSA requires states to report actual per-pupil expenditures and conduct school-level fiscal resource allocation reviews (Cook-Harvey et al., 2016; Odden & Picus, 2019). These new requirements are designed to highlight spending patterns and inequities for school improvement purposes (U.S. Department of Education, 2016). A review of the literature revealed past policy requirements associated with school accountability legislation called for states to measure school performance but did not capture the extent to which schools used their financial resources to maximize student outcomes (Hanushek & Raymond, 2004). It is important to note the federal government provides a funding stream to support the nation's most vulnerable children, although the funding supplied is highly questionable because there is uncertainty about whether funding is enough (Ladd, 2017). Research remains inconclusive about the effect of educational dollars on student academic performance (Hedges et al., 2016; Odden & Picus, 2019). However, there is consensus in the literature that it may be worthwhile to more closely examine how resources are used to support student learning to promote critical conversations about educational equity and opportunity at the school level (Cook-Harvey et al., 2016; Dee et al., 2013). This claim is salient to this research study as the researcher sought to investigate the association between school site-level spending and student academic growth.

ESSA and Student Growth as a Measure of Progress

Like its predecessor (i.e., NCLB), the ESSA legislation focuses on school accountability, test-based performance, closing the achievement gap, and equal and equitable access to public education (U.S. Department of Education, 2016). However, the ESSA legislation brought about significant changes to address school reform, including allowing states to design their accountability systems (ESSA, 2015). A school accountability system's design is important because it identifies school performance measurement indicators (Figlio & Ladd, 2020). For example, state officials are required to evaluate schools based on student proficiency levels (i.e., status measures) or the extent to which individual student performance has changed (i.e., growth measures) from one year to the next (Figlio & Ladd, 2020; Hanushek & Raymond, 2002). States that opt for academic growth-based measures must use them for all students and subgroups in its accountability systems (U.S. Department of Education, 2016). In this way, the academic progress of all students remains the focus of school improvement.

It is plausible to use student growth models to measure educational attainment, given the current federal and state focus on school site-level student academic performance. Academic growth is defined as changes in knowledge over time (Anderman et al., 2015). Anderman et al. (2015) noted five types of growth models most commonly used in the United States: (1) student gain score model, (2) covariate adjustment model, (3) student percentile gain models, (4) univariate value-added response models, and (4) multivariate value-added response models. According to the National Research Council (2011), student growth measures as indicators of all students' academic progress are critically important within the school accountability context. Given this assertion, it is possible to understand why growth-based measurements are common in the United States.

Recent data has suggested all but two U.S. states have incorporated some form of student growth measurement in their approved state accountability plan (Data Quality Campaign, 2019). For instance, Michigan has elected to use student growth percentiles (SGP) as a measure (Michigan Department of Education, 2021). SGPs are a widely accepted measure for assessing individual student learning over time. Michigan's use of SGPs is designed to allow for more equitable student progress calculations (Michigan Department of Education, 2021). According to the Michigan Department of Education (2021), SGPs are the most appropriate to use as they reflect student learning progress in a particular subject area compared to another group of students who scored similarly on previous tests in the same subject area. From the SGP data, state education officials can rank students in each comparable group based on their current assessment. As such, each student can then receive a percentile ranking comparing their scores to other students who scored similarly academically (Michigan Department of Education, 2021). Michigan's student growth model also includes students' ability to obtain SGPs for each subject in which the student tests (e.g., ELA and mathematics) and where there is at least one previous test score for the student. Essentially, the current focus on school site-level accountability makes Michigan's SGP model attractive because these data provide information about individual student learning patterns at the school level.

The literature on student academic growth as a measure for school accountability has revealed advantages for this type of system. Student growth models are rooted in statistical methodology that assume estimated effects (Anderman et al., 2015). According to Anderman et al. (2015), the benefits of student growth models include the ability to provide an unbiased view of student achievement levels due to variability in preexisting student knowledge. Furthermore, the relationship between socioeconomic status and academic growth is less significant than

socioeconomic status and academic proficiency. Growth-based measures also provide schools an opportunity to acknowledge student progress (Anderman et al., 2015). Given the advantages of growth-based measures, states like Michigan have an opportunity to highlight school performance based on fair and equitable measures.

Concluding this section, existing literature has argued growth-based measures provide a fair and reasonable means for assessing individual school and student performance in this era of school accountability. Historically, measuring school quality and student achievement levels have focused on one timepoint instead of performance over time (Finn et al., 2008). The value in incorporating growth-based measures is they allows for the consumption of robust data to address the long-standing achievement gap that exists in the United States. While growth-based measures are incredibly plausible, only valid and reliable data are helpful. Significant consequences may result from psychometrically unreliable or invalid evaluations used to measure development, especially when making decisions about an individual student's progress (Anderman et al., 2015). As such, states may benefit from carefully considering when to use performance-based measures to assess student academic growth.

School Accountability and Performance-Based Measures

Performance-based school accountability has become an increasingly important issue in K-12 education. Performance-based accountability is defined as the process of assessing, rewarding, and sanctioning schools based on aggregated student test results (Figlio & Ladd, 2020). Although performance-based measurement policies have been enacted in many U.S. states, test-based school accountability did not become a nationwide focus until the federally legislated NCLBA of 2001 was enacted (Hanushek & Raymond, 2002). According to Dee and Jacob (2011), the motivation for performance-based accountability policy in the United States is rooted in the

belief that public reporting of school site-level data and the explicit link between student academic performance on state assessments and school sanctions would increase student performance in schools. Disputing the claim that public reporting of student academic performance leads to increased student performance, Hanushek and Raymond (2005) contended the consequences of accountability (e.g., rewards and sanctions) have a greater impact on student performance than public reporting. While Dee and Jacob's (2011) and Hanushek and Raymond's (2005) claims offered a plausible argument for the motivation behind performance-based accountability in the United States, there is a more pressing point to consider. That is, the critical point of discussion lies not in the rationale behind the implementation of performance-based accountability, but rather on the effects of school accountability measures on student academic outcomes.

The Effects of School Accountability on Student Academic Outcomes

A broad body of literature has emerged on the effects of school accountability policy on student academic outcomes. The broad research interest in this area is not surprising given the value society has placed on educational attainment and its role in adult economic status (Jackson et al., 2016). According to Jackson et al. (2016), educational attainment has been linked to increased adult financial status. Related to this, Figlio and Rouse (2006) argued school accountability systems positively impact educational attainment among K-12 students. Taken together, these findings provide a plausible rationale for extensively researching the effects of school accountability on student academic outcomes. For example, Hanushek and Raymond (2005) provided some insight into the topic and found accountability systems' institution improves student academic performance by 0.2 standard deviations. This finding is noteworthy given earlier school reform efforts have failed to yield comparable results (Hanushek & Raymond, 2005). The link between the controversial standards-based movement and the emergency of school

accountability systems is also noted in the literature. According to Grissmer et al. (2000), the intersection between curriculum standards and test-based accountability have produced faster achievement rates in some states. While school accountability has been linked to improved student outcomes, the literature has also revealed these effects may depend on the specific student and school characteristics.

Studies have suggested school accountability has improved student academic performance, but results have been more pronounced among specific subgroups, individual grades, subjects, and according to state-level accountability context (Hanushek & Raymond, 2005; Ladd, 2017). For example, Loeb and Byun (2019) found scores on the national assessment during the NCLB era rose and racial and ethnic achievement gaps were modestly narrowing. This effect was reported for African American students in certain grades where they demonstrated faster academic progress than their White peers (Loeb & Byun, 2019). Dee and Jacob (2010) conducted a causal study that compared states with no prior accountability system (i.e., treatment group) to states with a prior accountability system (i.e., control group). They found statistical significance in the academic performance among fourth and eighth grade students, such that math performance increased for White, Hispanic, and low socioeconomic students during the NCLB years. Findings from these analyses also revealed positively moderate increases in math test scores for fourth grade Black students. In contrast, they reported no effects of NCLB on either fourth or eighth grade students' reading scores. Using a panel-based research design, Dee and Jacob (2010) posited they could confidently associate student academic performance with NCLB's impact. In this case, Dee and Jacob (2010) concluded their methodology was reliable. However, evidence from later studies points to a different conclusion.

A further review of the literature revealed debate over Dee and Jacob's (2010) findings (Ladd, 2010; Lee & Reeves, 2012). For example, Ladd (2010) challenged their findings based on two claims. First, Ladd (2010) argued the outcomes among fourth grade students were likely due to prior year achievement, given the largest assessment gains for fourth grade math reflected in the 2003 NAEP scores. Second, Ladd (2010) argued any improvements reflective of the 2003 school year were moot since it was too early to attribute the accountability policy results to learning related to the current school year (Ladd, 2010). Building on the methodology of Dee and Jacob (2010), Lee and Reeves (2012) found no significant effects of school accountability as a reform mechanism on overall reading and math achievement or achievement gaps. These findings suggest there is uncertainty on the effects of school accountability on student academic outcomes. One reason may be because it is difficult to isolate the effects of school accountability from other factors such as sociodemographic and school characteristics (Hanushek & Raymond, 2005). The research literature continues to evolve in this area as scholars use rigorous statistical analyses to address this issue.

In conclusion, the studies assessing the effects of school accountability on student academic outcomes remain inconclusive. The goal of school accountability policies is to ensure all students have access to and opportunity for education while receiving quality academic instruction (Diamond & Spillane, 2004; Lee & Reeves, 2012). While numerous studies have argued school accountability is positively linked to improved student outcomes (Figlio & Rouse, 2006; Hanushek & Raymond, 2005; Jacob, 2005), there is debate about whether school accountability policies benefit some students more than others. Notably, the argument exists about the effects of school accountability on narrowing the racial achievement gap (Diamond & Spillane, 2004; Ladd, 2017; Lee & Reeves, 2012). While Diamond and Spillane (2004) argued school

accountability policies may lead to the marginalization of low-performing students, Hanushek & Raymond (2005) found school accountability policies had the reverse effect on low-performing students. Given the uncertainty presented the research literature, the role school accountability plays in ensuring all students have opportunity and access to high-quality educational attainment warrants further investigation.

Summary

Improving the academic performance of U.S. public school students is a complex matter. When considering the unique needs of students, such as those of adolescent or middle school students, the complexity becomes even greater. Factors such as fiscal resources, student and school-level characteristics, and accountability policy mandates play a significant role in school reform efforts. While a debate about the effects of school spending on student academic performance presides, an increasing number of causal studies have provided evidence that school-level fiscal resources and student academic outcomes are related (Jackson et al., 2016). Researchers have suggested the strategic investment of school-level funds in areas such as human and capital resources can significantly improve student academic performance (Hong & Zimmer, 2016; Miles & Frank, 2008). The rationale for this assentation is money can purchase the goods and resources needed to impact students' learning environment. This study aimed to understand the relationship between spending and middle school student academic performance. Chapter 3 describes the methodology used in this study to accomplish this goal.

CHAPTER 3: METHODOLOGY

This chapter outlines the research methodology used in this study. The chapter begins with a restatement of the purpose and research question, followed by a detailed description of the data collection methods and analysis applied in this study. The chapter concludes with an ethical statement related to the study.

Research Purpose

The purpose of this quantitative ex-post facto research study was twofold: (1) to investigate the association between school-level spending and student academic growth through the lens of OST and (2) to identify the student and school-level characteristics that may mediate the association between school-level spending and student academic growth. The variables measured in this study represent the components of the open systems model: (1) inputs (i.e., total site-level expenditures per-pupil), (2) throughputs (i.e., school-level characteristics), and (3) outputs (i.e., student academic growth). The "feedback" and "environment" components are represented through the school accountability data used in this study.

Research Question

This study addressed the following research question:

> Is school-level per-pupil spending associated with student academic growth in mathematics and ELA among seventh grade students in Michigan, as measured by the 2018-2019 M-STEP statewide assessment?

To answer the research question guiding this study, three outcome measures were identified: (a) average student growth percentile, (b) percentage of students with average growth, and (c) percentage of students with below average growth on the 2018-2019 M-STEP statewide assessment. Student sociodemographics such as race/ethnicity, socioeconomic status, and special

education designation, and school-level structural characteristics such as grade-level configuration, school type, and total school enrollment served as control variables to rule out alternative explanations.

Research Design

A quantitative ex-post facto study was chosen to conduct this investigation. The quantitative research approach is commonly used in education research to examine the effects of school spending on student academic outcomes (Hedges et al., 2016). Using archival data from the 2018-2019 school year, the nonexperimental research design was employed to examine whether an association existed between school-level spending and student academic growth and to determine whether student sociodemographic and school-level structural characteristics mediated the association. The quantitative approach was appropriate for the following reasons: (a) the purpose of this study was to investigate the association between variables in a population, (b) a large, preexisting dataset with numerical data was used for data analysis, and (c) rigorous statistical techniques were required to estimate the association between variables and to obtain a greater degree of confidence in the associations that emerge between variables (Creswell & Creswell, 2018; Fraenkel et al., 2011).

Setting

The schools selected for this study were located in the state of Michigan. The academic performance of K-12 public school students, particularly middle school students, is a concern among policy makers and practitioners. For example, in the 2018-2019 school year, while an estimated $13 billion was spent on K-12 public education in Michigan (Summers, 2019), less than half of seventh grade students (i.e., roughly 40%) demonstrated average growth on the state's mathematics and ELA assessment (Michigan’s Center for Educational Performance and

Information, 2021). The data also highlighted achievement gaps among student subgroups (Michigan's Center for Educational Performance and Information, 2021). For instance, less than half of seventh grade African American, Hispanic, economically disadvantaged, and special education students demonstrated average growth in mathematics during the 2018-2019 school year. The reported results were nearly the same for each seventh grade ELA subgroup (Michigan's Center for Educational Performance and Information, 2021). It is important to note the academic struggles of Michigan's seventh grade students were observed in both traditional public and charter public school academies (Michigan's Center for Educational Performance and Information, 2021). These data suggested an academic disadvantage for students who reached the halfway mark in their K-12 educational experience in Michigan—a disadvantage that continues to plague our most vulnerable student populations.

Population

This study's population was traditional public schools and charter public school academies that served seventh grade students in Michigan during the 2018-2019 school year. These public school educational entities were responsible for providing mathematics and ELA instruction and administering the statewide assessment in these core subject areas to enrolled students. While the association between school spending and student outcomes has been broadly studied in the research literature, to the researcher's knowledge, no studies have specifically examined the effects of school spending on student academic growth, particularly among seventh grade students. Given this literature gap, traditional public schools and charter public school academies serving seventh grade students were selected as the population for this study. Seventh grade students were considered middle school students for this study. However, it is necessary to note public schools and charter public school academies in Michigan that served seventh grade students during the

2018-2019 school year were made up of various grade-level configurations. As such, the population for this research study comprised of school types based on four school grade-level designs in Michigan:

1. Elementary through middle school (Grades K-8)
2. Middle school (Grades 6-8)
3. Middle through high school (Grades 6-12)
4. Elementary through high school (Grades K-12)

Unique educational providers, such as online, cyber, virtual schools, and court placed facilities, that served seventh grade students during the 2018-2019 school year were excluded from this research study (n = 7).

Sample

The study's sample included data from the Michigan Center for Educational Performance and Information (CEPI), the Michigan Department of Education's (MDE) official public education data source, for 847 schools from 667 districts. Among the school districts, only one school represented 611 of the total 847 schools and more than one school represented 236 of the total 847 schools. Among the 847 schools included in the sample, some schools were excluded for incomplete dependent and independent variable data (n = 44). When identifying the sample for the variable percent ELL, an additional number of schools was excluded from analysis based on missing data (n = 477). Thus, the final analytic sample consisted of 803 school for all school district samples and 326 for school districts with percentage ELL sample.

Data Collection

To answer the research question, the researcher analyzed 2018-2019 school and student-level archival data to investigate the association between school-level per-pupil spending and

seventh grade student academic growth in ELL and mathematics in Michigan. Specifically, three publicly available school-level reports accessed from the Michigan Center for Educational Performance and Information provided information on school total site-level expenditures, student enrollment, achievement levels, and sociodemographic information for all traditional public and charter public school academies.

Instrumentation

The instruments used for the purpose of this research study were developed by the Michigan Department of Education (Michigan Center for Educational Performance and Information, 2021). The next section describes how the key variables were conceptualized and measured in the study. A general overview of the instruments is provided.

Measure of Student Growth

The 2018-2019 M-STEP was the instrument used to assess student growth data. The M-STEP is an annual, standardized statewide assessment administered to students in Grades 3 through 8 in ELA and mathematics. The M-STEP is designed to measure whether students are meeting the state learning standards and grade-level expectations (Michigan Department of Education, 2019). Student academic performance on the M-STEP is used for school accountability purposes under the ESSA legislation. All Michigan public schools and charter public school academies are required to administer the test annually.

The unit of measurement was the average student growth percentile in mathematics and ELA on the M-STEP for the 2018-2019 school year. It is important to note the intentional decision to focus on 2018-2019 data. Although an examination using trend data covering multiple years would have likely strengthened the research study, the decision to only use data from the 2018-2019 academic year was based on the following rationale:

1. There were changes and variations in the state assessment design (i.e., the state transitioned from MEAP to M-STEP) and school accountability metrics prior to the 2018-2019 school year.
2. In Michigan, school-level resource allocation data were not reported to the state education agency until the ESSA requirement came into effect during the 2018-2019 school year.
3. There was no state assessment administered during the following years due to COVID-19 pandemic academic interruptions.

Essentially, the 2018-2019 academic year was the only year where the ESSA school-level fiscal reporting requirement was aligned with a fixed state-level educational assessment. The student academic growth data communicated the degree to which a student learned in mathematics and ELA compared to a group of academic peers with similar scores on the previous test (Michigan Department of Education, 2019). The choice to focus on student academic growth data in mathematics and ELA was also intentional for several reasons. First, mathematics and ELA are considered core subject areas for seventh grade students (Odden & Picus, 2019). Second, student academic performance in mathematics and ELA is tied to school accountability evaluations. Third, school-level fiscal resources are devoted to supporting classroom instruction quality in these core subject areas (Odden & Picus, 2019). Most importantly, Michigan's M-STEP assessment for Grade 7 is administered in mathematics and ELA (Michigan Center for Educational Performance and Information, 2021).

Reliability. Reliable data is important for conducting a research study (Campbell & Stanley, 1963). This study's archival data were obtained from the CEPI. The MDE partners with the CEPI for collecting, securely managing, and reporting education data in Michigan (Michigan

Center for Educational Performance and Information, 2021). For the 2018-2019 assessment year, the MDE reported partnering with the Data Recognition Corporation (DRC) for psychometric services (Michigan Department of Education, 2019). The DRC psychometric team verified the data obtained from the MDE followed the rules, structure, and specifications agreed on between both the DRC and the MDE. The MDE reported issues around unexpected data for missing data fields were addressed (Michigan Department of Education, 2019). The MDE also reported adhering to the standards for developing and maintaining tests of the highest quality as set forth by the American Education Research Association, American Psychological Association, and the National Council on Measurement in Education (Michigan Department of Education, 2019). The reliability of each M-STEP test was calculated (Michigan Department of Education, 2019). Reports on total score reliabilities, the overall standard errors of measurement (SEMs), and conditional standard errors of measurement (CSEMs) by decile are publicly available on the MDE website.

Validity. The MDE noted measures taken to ensure the academic growth model's validity. These measures included the psychometrician's written base R code and consultant and statistical analyst verification (Michigan Department of Education, 2019). According to the MDE (2019), the code for each subject was reviewed. Student growth percentile values were internally checked for reasonability and two staff members from the psychometric services team verified aggregate results through independent replication (Michigan Department of Education, 2019). The MDE reviewed the reasonability of the aggregate and individual student growth percentile results and reported several analysis iterations were completed for independent replication and review until all discrepancies were resolved (Michigan Department of Education, 2019). Detailed measures on data validity were noted and made publicly available on the MDE website.

Measure of School-Level Spending

The ESSA (2015) school accountability legislation required the reporting of school-level per-pupil expenditures beginning in the 2018-2019 school year (Every Student Succeeds Act, 2015). The total site-level per-pupil expenditures for the 2018-2019 school year were the primary input variables for this research study. The total site-level per-pupil expenditures are defined as the sum of total expenditures per-pupil by a school district spent in a specific school. This amount included both school district-designated expenditures to a specific school and expenditures allocated across all schools in the district on an equal, per-pupil basis (Michigan Department of Education, 2020).

The instrument used to gather school-level expenditure data was the 2018-2019 School Level Expenditure Report obtained from the CEPI. The School Level Expenditure Report publishes financial data in the financial information database that Michigan districts certified and submitted (Michigan Center for Educational Performance and Information, 2021). Any outliers observed in the report reflected the data CEPI received within the financial data collection period (Michigan's Center for Educational Performance and Information, 2021). The report broke down school-level expenditures of federal, state, and local funds for each fiscal year for traditional public and charter public-school academies in the state. A limitation to analyzing this data is that contextualized district and school issues and other variances impact the ability to compare financial data between districts.

Additional Measures

Table 1 provides descriptive information for each variable in the study. Additional measures reflected in this study included student sociodemographic and school-level information.

Table 1

Variable Descriptive Information

Variables	*Variable Description*
Dependent Variable	
Average Student Growth Percentile	The average of the individual student growth percentile scores of students assessed on a given subject, in each group; measured separately for English language arts and mathematics; source of data: CEPI school-level data (2018-19)
Percentage of Students with Average Growth	The percentage of students in the school who exhibited average growth; measured separately for English Language Arts and mathematics; source of data: CEPI school-level data (2018-19)
Percentage of Students with Below Average Growth	The percentage of students in the school who exhibited below average growth; measured separately for English Language Arts and mathematics; source of data: CEPI school-level data (2018-19)
Independent Variables	
Total Site-Level Expenditures Per-Pupil	The total amount of expenditures per-pupil by a school district spent in a specific school; source of data: CEPI school-level data (2018-19)
Percentage of African American Enrollment	Percentage of students classified as African American enrolled in the school; source of data: CEPI school-level data (2018-19)
Percentage of Hispanic Enrollment	Percentage of students classified as Hispanic enrolled in the school; source of data: CEPI school-level data (2018-19)
Percentage of Economically Disadvantaged Enrollment	Percentage of students classified as economically disadvantaged enrolled in the school; source of data: CEPI school-level data (2018-19)
Percentage of English Language Learners Enrollment	Percentage of students classified as English language learners enrolled in the school; source of data: CEPI school-level data (2018-19)
Percentage of Special Education	Percentage of students classified as special education enrolled in the school; source of data: CEPI school-level data (2018-19)
Charter School Status	Whether or not a school was designated as a charter school under a provision in the Michigan Revised School Code; source of data: CEPI educational entity data (2018-19)
Grade-Level Configuration	The grade levels served at each school level reported to CEPI for educational programming; source of data: CEPI educational entity data (2018-19)
Total Site-Level Enrollment	Number of students enrolled at the school level; source of data: CEPI student enrollment counts report (2018-19)

Procedures

The researcher was responsible for accessing, collecting, organizing, storing, securing, and analyzing the data from reports obtained from the CEPI. A careful and comprehensive data analysis of the reports obtained from the CEPI was conducted. To identify the sample population needed for the study, the researcher established a list of school characteristic criteria. School eligibility for the study included either traditional public schools or charter public school academies in Michigan that served seventh grade students, excluding online, cyber, virtual schools, and youth detention centers. A listing of all traditional public schools and charter public school academies in Michigan serving seventh grade students during the 2018-2019 school year was obtained. The researcher constructed a school-level database using Microsoft Excel software version 16.47 to organize and store the data. The schools' listings were then reviewed to identify schools that did not meet the criteria for this research study. Schools that did not meet the criteria for this research study were identified and excluded from the dataset. The MDE's Educational Entity Master (EEM), a roster of active Michigan schools during the 2018-2019 school year, and a review of individual school websites were used to verify school eligibility or exclusion from the research study. Once school eligibility for the research study was confirmed, school-level financial, student growth, and sociodemographic data were obtained from each school and added to the school-level database the researcher constructed. Only the researcher could access the data.

Analytic Approach

The results of this study emerged from an analytic approach similar to Borman and Dowling (2010), who sought to test the effects of school resources and school and student-level characteristics on student achievement. Data was imported into SPSS version 26.0 for data analysis. Multilevel linear regression models were conducted to identify the association between

school-level characteristics (per-pupil spending, student sociodemographic, and school-level structural characteristics) and seventh grade student academic growth measures in ELA and mathematics aggregated across schools in Michigan for the 2018-2019 academic year. Multilevel models were used since schools were nested within districts to allow for the nested error structure of the data and the variation in aggregate level student performance within schools and between districts (Raudenbush & Bryk, 2002). The general format of the estimated multilevel regression models was as follows:

Level 1 Model (y = student academic growth aggregated across schools)

$$y_{ij} = \beta_{0j} + \beta_{1j}\text{per-pupil spending}_{ij} + \beta_{2j}\text{grade-level vonfiguration}_{ij} + \beta_{3j}\text{charter status}_{ij} + \beta_{4j}\text{total enrollment}_{ij} + \beta_{5j}\text{ percentage of African American enrollment}_{ij} + \beta_{6j}\text{ percentage of Hispanic enrollment}_{ij} + \beta_{7j}\text{ percentage of economically disadvantaged enrollment}_{ij} + \beta_{8j}\text{ percentage of special education}_{ij} + e_{ij}$$

Level 2 Model:

$$\beta_{0j} = \theta_{00} + r_j$$
$$\beta_{1j} = \theta_{10}$$
$$\beta_{2j} = \theta_{20}$$
$$\beta_{3j} = \theta_{30}$$
$$\beta_{4j} = \theta_{40}$$
$$\beta_{5j} = \theta_{50}$$
$$\beta_{6j} = \theta_{60}$$
$$\beta_{7j} = \theta_{70}$$
$$\beta_{8j} = \theta_{80}$$

Combined Model:

$$y_{ij} = \theta_{00} + \theta_{10}\text{per-pupil spending}_{ij} + \theta_{20j}\text{grade-level configuration}_{ij} + \theta_{30j}\text{charter status}_{ij} + \theta_{40j}\text{total enrollment}_{ij} + \theta_{50j}\text{percentage of African American enrollment}_{ij} + \theta_{60j}\text{ percentage of Hispanic enrollment}_{ij} + \theta_{70j}\text{percentage of economically disadvantaged enrollment}_{ij} + \theta_{80j}\text{percentage of special education}_{ij} + r_j + e_{ij}$$

The model estimated student academic growth aggregated across schools for school *i* in district *j* as a function of individual school per-pupil spending and student and school characteristics. Because the model uses an identity link function with a Gaussian outcome variable

(Pan & Lin, 2005), the error terms are assumed to follow a normal distribution, with *r* representing the error term for district *j* and *e* representing the school error term nested within district *j*.

Multiple statistical models were estimated for the purposes of this research study. First, an unconditional model was estimated to identify covariance parameters across Levels 1 and 2 and establish baseline model fit statistics. Second, student academic growth aggregated across schools was modeled as a function of per-pupil spending only. Third, student academic growth aggregated across schools was modeled as a function of per-pupil spending, grade-level configuration, charter status, total enrollment, percentage of African American enrollment, percentage of Hispanic enrollment, percentage of economically disadvantaged enrollment, and percentage of special education enrollment. Fourth, since data for enrolled ELL percentage were missing for 56% of schools, ancillary models were estimated. In the ancillary model, student academic growth aggregated across schools was modeled as a function of both per-pupil spending, grade-level configuration, charter status, total enrollment, percentage of African American enrollment, percentage of Hispanic enrollment, percentage of economically disadvantaged enrollment, percentage of special education enrollment, and percentage of ELL enrollment. A $p < .05$ was used to determine statistical significance for all analyses.

Descriptive Statistics

Table 2 provides descriptive statistics for the variables included in analyses. Student academic growth aggregated across schools was operationalized using six measures: (a) average student growth percentile for math, (b) average student growth percentile for ELA, (c) percentage of students with average growth for math, (d) percentage of students with average growth for ELA, (e) percentage of students with below average growth for math, and (f) percentage of students with below average growth for ELA. Student characteristics included the following

variables: percentage of African American students enrolled, percentage of Hispanic students enrolled, percentage of economically disadvantaged students enrolled, percentage of special education students enrolled, and percentage of ELL students enrolled. School-level characteristics comprised the following variables: grade-level configuration, charter status, and total school-level student enrollment. Since the percentage of ELL students enrolled was missing data for 56% of schools, this analytic approach was completed on two samples: (1) all school districts and (2) school districts with percentage ELL reported.

Table 2

Descriptive Statistics for all Study Variables

Variable	Total Sample				
	N	*M*	*SD*	Min	Max
Math student growth %	803	50.23	9.11	24.2	78.6
Math % below average	803	30.24	11.71	5.3	69.7
Math % at average	803	39.91	7.29	5.6	75.7
ELA student growth %	803	49.52	8.73	22.4	73.1
ELA % below average	803	31.14	11.78	5.6	77.3
ELA % at average	803	28.97	11.10	5.3	68.4
Site level Spending ($)	803	10,886.71	2292.31	818.60	25409.96
Total enrollment	803	525.30	247.37	79	1646
% African American	803	23.78	34.47	0.00	100.00
% Hispanic	803	7.83	12.39	0.00	94.26
% Economically disadvantaged	803	57.44	24.96	3.46	100.00
% Special education	803	12.55	4.13	2.41	29.82
% English learners	326	13.28	16.65	0.87	78.95
Grade level configuration					
Elementary through HS	803	0.09	0.29	0	1
Elementary through MS	803	0.34	0.47	0	1
Middle School	803	0.43	0.50	0	1
MS through HS	803	0.14	0.35	0	1
Charter status	803	0.20	0.40	0	1
Variable	ELL Sample				
	N	*M*	*SD*	Min	Max
Math % below average	326	50.35	8.26	28.0	78.5
Math % at average	326	30.26	10.45	5.9	65.3
ELA student growth %	326	29.90	10.85	6.1	64.7
ELA % below average	326	50.05	10.40	10.0	64.0
ELA % at average	326	30.36	10.40	26.1	73.1
Site level Spending ($)	326	29.40	10.38	5.3	66.7
Total enrollment	326	11,232.06	2,195.65	3,031.35	19.580.78
% African American	326	653.96	243.37	80	1646
% Hispanic	326	21.18	23.83	0.00	96.74
% Economically disadvantaged	326	13.88	17.27	0.00	94.26
% Special education	326	56.27	26.71	3.46	100.00
% English learners	326	11.97	4.18	3.51	29.82
Grade level configuration	326	13.28	16.65	0.87	78.95
Elementary through HS					
Elementary through MS	326	0.20	0.40	0	1
Middle school	326	0.06	0.25	0	1
MS through HS	326	0.30	0.46	0	1
Charter status	326	0.55	0.50	0	1

Ethical Statement

During this research study, ex-post facto data were obtained ethically from the MDE publicly accessible platform to mitigate risk to human participants. The use of ex-post facto data minimized potential conflicts of interest and researcher bias.

Summary

Chapter 3 outlined the methodology used in this study to address the research question. Presented in this chapter was a detailed description of data collection methods and analytical approach applied. Chapter 4 presents the detailed results of the data analyses.

CHAPTER 4: RESULTS

The results of data analyses are presented in this chapter. The first section describes the analytical approach used to determine the variance between school districts related to the outcome variables. Results of statistical analyses used to address the research question are presented in the second section. Ancillary results are presented in the final section of this chapter.

The purpose of this quantitative ex-post facto research study was to investigate the association between school-level spending and student academic growth in mathematics and ELA among seventh grade students in Michigan measured by the 2018-2019 M-STEP.

This study addressed the following research question:

> Is school-level per-pupil spending associated with student academic growth in mathematics and ELA among seventh grade students in Michigan, as measured by the 2018-2019 M-STEP statewide assessment?

To answer the research question guiding this study, three outcome measures were identified: (a) average student growth percentile, (b) percentage of students with average growth, and (c) percentage of students with below average growth on the 2018-2019 M-STEP statewide assessment. An analysis was conducted to explore this association based on student sociodemographics such as race/ethnicity, socioeconomic status, and special education designation, and school-level structural characteristics such as grade-level configuration, school type, and total site-level enrollment.

Analytical Approach

Unconditional Models

Prior research studies have highlighted the strong influence student and school-level characteristics have on student academic performance (Malone et al., 2020). Tables 3, 4, and 5

present the district-level variance components each unconditional model produced. Intraclass correlation coefficients (ICCs) were computed for each outcome measure by dividing the district-level variance component by the total variance. The resulting ICC indicated 7% to 9% of the variability in student growth measures for mathematics aggregated across schools emerged between sample districts, a statistically insignificant difference ($p > .05$). For ELA, the ICC indicated 19% to 21% of the variability in average student growth percentile and percentage of students with below average growth emerged between sample districts, a statistically significant difference ($p < .05$). No variability in percentage of students with average growth emerged between districts.

While these findings indicated factors other than the school district (e.g., student sociodemographic and school-level structural characteristics) account for much of the variability in the outcome measures, the ICCs suggested there was some variation in student growth aggregated across schools, justifying a multilevel modeling approach. The ICC values for the unconditional models in the ELL sample were slightly larger, ranging between 3% to 40% for all outcome measures, further justifying the use of multilevel modeling in that sample.

Results

Primary Findings

The next section presents the primary results from the study. The results are reported in sequential order according to each of the outcome variables in the study.

Outcome Measure 1 - Student Growth Percentile

The first outcome measure was the average student growth percentile in mathematics and ELA among seventh-grade students. Table 3 Model 2 showed when not controlling for student sociodemographic or school-level structural variables, per-pupil spending was not significantly

associated with student growth percentile in mathematics. Table 3 Model 3 showed that after adjusting for student sociodemographic or school-level structural variables, per-pupil spending was approaching statistical significance in mathematics. The percentage of economically disadvantaged students, as shown in Table 3 Model 3, was not significantly associated with student growth percentile in mathematics. Similarly, school grade-level configuration was not significantly associated with the student growth percentile in mathematics. Charter school status was significantly associated with student growth percentile in mathematics.

Concerning ELA, Table 3 Model 5 showed that per-pupil spending was negatively associated with student growth percentile. After adjusting for student sociodemographic and school-level structural variables, Table 3 Model 6 showed that per-pupil spending was significantly associated with student growth percentile in ELA. The percentage of economically disadvantaged students, as shown in Table 3 Model 6, was significantly associated with student growth percentile in ELA. Likewise, school grade-level configuration was significantly associated with student growth percentile in ELA while charter school status was positively associated with student growth percentile in ELA. The models showed after controlling for student sociodemographic and school-level structural variables, on average, variation in funding levels across schools were associated with higher student growth percentile in mathematics and ELA. A $1,000 increase in the level of per-pupil spending associated with a 0.3 percentage point increase in student growth percentile in mathematics and a 0.4 percentage point increase in student growth percentile in ELA.

Table 3

Multilevel Models for Student Percentile Growth

	Mathematics			English Language Arts		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	50.01***	51.63***	55.53	49.59***	51.76***	50.56***
	(0.34)	(1.67)	(2.39)	(0.33)	(1.65)	(2.23)
Spending		-0.0002	0.0003*		-0.0002	0.0004**
		(0.0002)	(0.0002)		(0.0002)	(0.0002)
% African			-0.02			-0.03*
American			(0.02)			(0.02)
% Hispanic			0.03			-0.006
			(0.03)			(0.03)
% Econ Dis			-0.09***			-0.05***
			(0.02)			(0.02)
% Spec Ed			-0.16*			-0.12
			(0.08)			(0.08)
Enrollment			-0.0008			0.002*
			(0.001)			(0.001)
Grade-level configuration						
Elem-HS			-4.49***			-4.93***
			(1.21)			(1.14)
Middle			-2.89***			-2.21***
			(0.86)			(0.80)
Mid-HS			-5.09***			-6.07***
			(1.08)			(1.01)
Charter			4.84***			6.66***
			(1.18)			(1.10)
σ^2	75.99***	75.36***	64.92***	62.20***	62.47***	58.95***
	(5.85)	(5.82)	(5.38)	(6.33)	(6.40)	(6.09)
τ_π	6.67	7.38	9.91**	14.95**	14.55**	6.73
	(4.96)	(4.98)	(4.97)	(6.60)	(6.66)	(6.05)
Deviance	5819.01	5833.75	5729.65	5751.50	5765.45	5629.33
n	803	803	803	803	803	803

Note. *$p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Outcome Measure 2 - Percentage of Students With Average Growth

As shown in Table 4 Model 8, when not controlling for student sociodemographic and school-level structural variables, per-pupil spending was significantly associated with the percentage of students with average growth in mathematics. After adjusting for student sociodemographic and school-level structural variables, per-pupil spending remained a statistically

significant predictor of percentage of students with average growth in mathematics (Table 4 Model 9). Specifically, the model showed after controlling for student sociodemographic and school-level structural characteristic variables, per-pupil spending, on average, was associated with a lower percentage of students with average growth in mathematics. A $1,000 variation in funding across schools was associated with a 0.5 percentage point decrease in the percentage of students with average growth in mathematics. Table 4 Model 9 also showed school sociodemographic, and school-level structural variables were not significantly associated with the percentage of students with average growth in mathematics.

Table 4 Model 11 showed that per-pupil spending was not statistically associated with the percentage of students with average growth in ELA. After adjusting for student sociodemographic and school-level structural variables in the ELA model, per-pupil spending remained statistically insignificant (Table 4 Model 12). Only the percentage of Hispanic students was significantly associated with the percentage of students with average growth in ELA (Table 4 Model 12).

Table 4

Multilevel Models for Percentage of Students With Average Growth

	Mathematics			English Language Arts		
Variable	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	40.10***	44.04***	44.60***	39.90***	40.75***	40.90***
	(0.27)	(1.30)	(2.00)	(0.24)	(1.18)	(1.88)
Spending		-0.0004***	-0.0005***		-0.0001	-0.0001
		(0.0001)	(0.0001)		(0.0001)	(0.0001)
% African			0.02			0.02
American			(0.01)			(0.01)
% Hispanic			0.002			0.07***
			(0.002)			(0.02)
% Econ Dis			-0.001			-0.01
			(0.02)			(0.02)
% Spec Ed			0.04			-0.005
			(0.07)			(0.001)
Enrollment			0.0006			-0.001
			(0.001)			(0.001)
Grade-level configuration						
Elem-HS			0.04			-0.56
			(1.02)			(0.96)
Middle			-0.57			0.71
			(0.72)			(0.66)
Mid-HS			-0.39			-0.48
			(0.90)			(0.84)
Charter			-1.46			0.38
			(0.98)			(0.89)
σ^2	49.20***	50.41***	48.65***	47.51***	47.54***	46.27***
	(3.57)	(3.30)	(3.97)	(2.37)	(2.38)	(3.56)
τ_π	3.67	1.78	4.09	0.00	0.00	0.84
	(2.86)	(2.29)	(3.50)	(0.01)	(0.01)	(2.87)
Deviance	5461.41	5468.60	5457.79	5379.21	5395.12	5372.43
n	803	803	803	803	803	803

Note. *$p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Outcome Measure 3 - Percentage of Students With Below Average Growth

Table 5 Model 14 showed the percentage of students with below average growth in mathematics was significantly associated with per-pupil spending. After adjusting for student sociodemographic and school-level structural characteristic variables, per-pupil spending was not significantly associated with the percentage of students with below average growth in mathematics (Model 15). The percentage of economically disadvantaged students and school grade-level

configuration were positively associated with the percentage of students with below average growth in mathematics (Model 15). Table 5 Model 15 shows charter school status was negatively associated with the percentage of students with below average growth in mathematics ($p < .01$).

Table 5 Model 17 showed per-pupil spending was not significantly associated with the percentage of students with below average growth in ELA. However, Table 5 Model 18 showed that after controlling for student sociodemographic and school-level structural characteristics, the percentage of students with below average growth in ELA was negatively associated with per-pupil spending. Table 5 Model 18 showed the percentage of economically disadvantaged students and school grade-level configuration were positively associated with the percentage of students with below average growth in ELA, while charter school status was negatively associated with the percentage of students with below average growth in ELA.

Table 5

Multilevel Models for Percentage of Students With Below Average Growth

	Mathematics			English Language Arts		
Variable	(13)	(14)	(15)	(16)	(17)	(18)
Intercept	30.41***	26.56***	21.15***	30.97***	28.71***	29.80***
	(0.44)	(2.17)*	(3.09)	(0.45)	(2.23)	(3.05)
Spending		0.0004	-0.0002		0.0002	-0.0005**
		(0.0002)	(0.0002)		(0.0002)	(0.0002)
% African			0.02			0.02
American			(0.02)			(0.02)
% Hispanic			-0.03			-0.03
			(0.04)			(0.04)
% Econ Dis			0.11***			0.07***
			(0.03)			(0.03)
% Spec Ed			0.20*			0.15
			(0.11)			(0.11)
Enrollment			0.0008			-0.002
			(0.002)			(0.002)
Grade-level configuration						
Elem-HS			5.85***			6.21***
			(1.57)			(1.55)
Middle			4.00***			2.39**
			(1.11)			(1.10)
Mid-HS			6.45***			7.83***
			(1.39)			(1.38)
Charter			-5.13***			-8.02***
			(1.53)			(1.51)
σ^2	125.10***	123.06***	109.26***	110.71***	111.40***	106.23***
	(12.10)	(11.53)	(10.63)	(12.43)	(16.68)	(12.54)
τ_π	12.34	14.20	16.36	29.98**	29.15**	16.32
	(11.62)	(11.06)	(10.52)	(13.46)	(13.73)	(13.12)
Deviance	6225.98	6237.91	6140.14	6230.73	6244.78	6120.27
n	803	803	803	803	803	803

Note. *$p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Ancillary Findings

In addition to the regression analyses with the percentage of ELLs entered as an independent variable into the multilevel regression model, a statistical assessment was conducted to determine how schools that did and did not report percentage of enrolled ELL students differed on study variables. Table 6 shows the descriptive statistics comparing schools that did and did not

report percentage of enrolled ELL students. The decision to conduct a comparison analysis between these schools was based on the sharp decline in the ELL student sample size ($N = 477$). Independent samples *t*-tests were used to test for differences in the continuous study variables between schools that did and did not report percentage of enrolled ELL students. Further, chi-square tests were used to test for differences in categorical variables between schools that did and did not report percentage of enrolled ELL students. Tables 7, 8, and 9 provide a summary of the regression analysis results. A $p < 0.05$ was used to determine statistical significance for all analyses.

Table 6

Comparison of ELL Study Variables

Variable	Have ELL		No ELL		t	*p*
	M	*SD*	*M*	*SD*		
% at average growth in math	39.84	5.51	39.54	8.67	0.630	0.529
% below average growth in math	30.26	10.45	30.76	13.22	-0.607	0.544
Avg. student growth % in math	50.35	8.26	50.08	10.47	0.410	0.682
% at average growth in ELA	40.25	5.33	39.51	8.26	1.575	0.116
% below average growth in ELA	30.36	10.40	31.97	13.23	-1.955	0.051
Avg. student growth % in ELA	50.05	8.08	49.32	9.93	1.168	0.243
Per-pupil spending	11,232.06	2195.65	10,741.64	2707.14	2.753	0.006
Enrollment	653.96	243.37	424.82	211.66	14.006	0.000
% African American	21.18	23.83	25.36	39.66	-1.913	0.056
% Hispanic	13.88	17.27	3.87	4.09	10.292	0.000
% Economically disadvantaged	56.27	26.71	58.50	23.63	-1.236	0.217
% Special education	11.97	4.18	12.98	4.12	-3.421	0.001
	n	%	*n*	%	X	*p*
Grade-level configuration					40.064	0.000
Elementary thru HS	21	6.4	61	11.7		
Elementary thru Middle school	99	30.4	191	36.7		
Middle school	178	54.6	177	34.0		
	28	8.6	92	17.7		

Variable	Have ELL		No ELL		t	*p*
	M	*SD*	*M*	*SD*		
Middle school thru HS Charter school	66	20.2	109	20.9	0.056	0.813

Table 7

Multilevel Models for Student Percentile Growth in the ELL Sample

	Mathematics			English Language Arts		
Variable	(19)	(20)	(21)	(22)	(23)	(24)
Intercept	50.06*** (0.52)	53.43*** (2.61)	56.11*** (3.78)	50.10*** (0.50)	53.70*** (2.51)	52.71*** (3.61)
Spending		-0.0003 (0.0002)	0.0004 (0.0003)		-0.0003 (0.0002)	0.0003 (0.0003)
% African American			-0.03 (0.03)			-0.01 (0.03)
% Hispanic			0.01 ().03)			-0.004 (0.03)
% Econ Dis			-0.11*** (0.03)			-0.10*** (0.03)
% Spec Ed			-0.24** (0.12)			-0.17 (0.12)
Enrollment			-0.001 (0.002)			0.002 (0.002)
Grade-level configuration						
Elem-HS			-5.28*** (1.85)			-5.58*** (1.78)
Middle			-2.76** (1.18)			-2.18* (1.14)
Mid-HS			-5.36*** (1.77)			-7.08*** (1.70)
Charter			5.24*** (1.68)			5.63*** (1.60)
% ELL			0.05 (0.04)			7.13* (3.90)
σ^2	45.49*** (6.59)	45.17*** (6.43)	40.83*** (5.57)	47.75*** (6.07)	47.48*** (6.06)	42.53*** (5.35)
τ_π	23.65*** (8.04)	23.91*** (7.85)	15.63** (6.20)	17.23*** (6.45)	17.31*** (6.48)	8.81* (5.15)
Deviance	2284.73	2297.87	2208.06	2271.90	2284.72	2186.03
n	326	326	326	326	326	326

Note. *$p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Table 8

Multilevel Models for Percentage of Students With Average Growth in the ELL Sample

	Mathematics			English Language Arts		
Variable	(25)	(26)	(27)	(28)	(29)	(30)
Intercept	39.89***	40.89***	39.71***	40.26***	39.61***	40.57***
	(0.32)	(1.63)	(2.75)	(0.30)	(1.58)	(2.54)
Spending		-0.0001	-0.0002		0.0001	-0.00001
		(0.0001)	(0.0002)		(0.001)	(0.0002)
% African			0.01			0.01
American			(0.02)			(0.02)
% Hispanic			-0.002			0.05***
			(0.02)			(0.02)
% Econ Dis			0.02			0.004
			(0.02)			(0.002)
% Spec Ed			0.10			-0.04
			(0.09)			(0.08)
Enrollment			0.001			-0.001
			(0.001)			(0.001)
Grade-level configuration						
Elem-HS			-1.24			-2.35*
			(1.38)			(1.27)
Middle			0.24			-0.12
			(0.87)			(0.81)
Mid-HS			0.42			-4.66***
			(1.30)			(1.20)
Charter			0.26			0.59
			(1.20)			(1.11)
% ELL			-0.03			0.01
			(0.03)			(0.03)
σ^2	28.95***	29.15***	29.57***	27.40***	27.39***	25.25***
	(2.73)	(2.76)	(3.01)	(2.73)	(2.76)	(2.45)
τ_π	1.40	1.25	0.96	1.01	1.09	0.75
	(1.63)	(1.66)	(2.01)	(1.79)	(1.85)	(1.50)
Deviance	2036.67	2052.14	2028.99	2015.36	2031.11	1978.49
n	326	326	326	326	326	326

Note. *$p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Table 9

Multilevel Models for Percentage of Students With Below Average Growth in the ELL Sample

	Mathematics			English Language Arts		
Variable	(31)	(32)	(33)	(34)	(35)	(36)
Intercept	30.54***	26.31***	23.15***	30.25***	26.31***	27.41***
	(0.67)	(3.34)	(4.88)	(0.64)	(3.23)	(4.57)
Spending		0.0004	-0.0004		0.0004	-0.0005
		(0.0003)	(0.0003)		(0.0003)	(0.0003)
% African			0.02			0.01
American			(0.03)			(0.03)
% Hispanic			-0.03			-0.02
			(0.04)			(0.04)
% Econ Dis			0.12***			0.12***
			(0.04)			(0.04)
% Spec Ed			0.27*			-0.21
			(0.15)			(0.15)
Enrollment			0.001			-0.002
			(0.002)			(0.002)
Grade-level configuration						
Elem-HS			7.51***			8.16***
			(2.39)			(2.26)
Middle			3.44**			2.40*
			(1.52)			(1.45)
Mid-HS			7.06***			11.02***
			(2.28)			(2.16)
Charter			-6.31***			-7.88***
			(2.17)			(2.02)
% ELL			-0.05			-0.09*
			(0.05)			(0.05)
σ^2	66.29***	68.05***	64.51***	78.85***	78.74***	69.43***
	(10.53)	(10.31)	(9.90)	(10.21)	(10.20)	(8.29)
τ_π	44.72***	44.78***	30.13***	28.89***	28.80***	13.12*
	(13.91)	(13.59)	(12.03)	(11.00)	(11.01)	(7.60)
Deviance	2438.31	2451.02	2366.42	2435.94	2448.85	2335.92
n	326	326	326	326	326	326

Note. *$p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Summary

Chapter 4 detailed the results of this study based on the study's guiding research question and the mediational analyses. Not all variables selected for this study were significant predictors of student academic growth. Chapter 5 provides a summary of the research study and conclusions

drawn based on the findings. The chapter concludes with implications and recommendations for future research directions.

CHAPTER 5: SUMMARY, CONCLUSIONS, RECOMMENDATIONS

This chapter summarizes the research conducted to address the research question. The first section restates the problem motivating this study followed by an overview of the research design. Next, a summary of the research findings is presented. Finally, the conclusion, implications, recommendations, and future research directions are discussed.

The purpose of this quantitative ex-post facto research study was to investigate the association between school-level spending and student academic growth in mathematics and ELA among seventh grade students in Michigan, as measured by the 2018-2019 M-STEP. This study addressed the following research question: Is school-level per-pupil spending associated with student academic growth in mathematics and ELA among seventh grade students in Michigan, as measured by the 2018-2019 M-STEP statewide assessment? Three indicators of student academic growth were measured for the purposes of this study: (a) average student growth percentile, (b) percentage of students with average growth, and (c) percentage of students with below-average growth on the 2018-2019 M-STEP statewide assessment. An analysis was conducted to explore this association based on student sociodemographic characteristics such as race/ethnicity, socioeconomic status, and special education designation, and school-level structural characteristics such as grade-level configuration, school type, and total site-level enrollment.

Overview of Problem

Michigan instituted aggressive school finance reform to address educational quality among K-12 public school students. Despite these efforts, middle school students' academic performance in Michigan has remained a focus of discussion. The most recent statewide assessment results revealed less than half of seventh grade students performed satisfactorily in mathematics and ELA.

Failure to address the academic performance of middle school students in Michigan could result in long lasting detrimental impacts educationally and societally.

Overview of Research Design

Data for this quantitative ex-post facto study were analyzed from three publicly available 2018-2019 school-level reports accessed from the CEPI. These publicly available reports provided individual school-level expenditure, achievement, student enrollment, and sociodemographic data for 847 traditional and public charter schools that served seventh grade students in Michigan. The analytic approach included descriptive statistics for each variable, multiple multilevel linear regression models, independent samples t-tests, and chi-square tests.

Summary of Findings

The findings from this study fall into two categories: (1) the association between site-level per-pupil spending and student academic growth and (2) the student sociodemographic and school-level structural characteristics that influence this association. The summary of findings for the present study are organized according to these two categories.

Association Between Per-Pupil Spending and Student Academic Growth

Evidence from this study suggested after controlling for student sociodemographic and school-level structural characteristics, per-pupil spending was associated with the average student growth percentile in seventh grade mathematics and ELA, measured by Michigan's statewide assessment. These patterns of results are similar to previous research literature findings that have suggested per-pupil spending is associated with higher standardized test scores in mathematics and ELA in Grades 3-11 (Kreisman & Steinberg, 2019). Abott et al. (2020), who estimated the impact of increases in school spending across diverse districts in multiple states, reported a $1,000 increase in per-pupil spending was associated with higher standardized test scores in mathematics

and ELA in Grades 3-8. Similarly, Giglotti and Sorensen (2018) also reported educational resources improved student learning.

A broad amount of research studies examining the relationship between school spending and student academic outcomes in the literature have exploited state school finance reforms (Abott et al., 2020; Giglotti & Sorensen, 2018; Kreisman & Steinberg, 2019). This study does not focus on state school finance reforms and its impact on student achievement. However, it is important to note the site-level per-pupil expenditures used in this study's analyses were a result of reform-induced spending in Michigan. The results from this study and the existing research literature suggested financial resources may unlock a greater potential for improving the academic performance of middle school students (Rebell, 2017).

Mediational Effects

In addition to investigating the effects of school spending, it was important to determine whether student sociodemographic and school-level structural characteristics accounted for the extent to which school site-level spending predicted student academic outcomes among seventh grade students in Michigan. Evidence suggested student sociodemographic and school-level characteristics mediated the relationship between site-level per-pupil spending and student academic growth in this research study. Prior research studies have highlighted the strong influence student and school-level characteristics have on student academic performance (Malone et al., 2020).

The results of this study revealed student sociodemographic characteristics mediated school spending and student academic growth in one or both subject areas among seventh grade students. For both mathematics and ELA, the percentage of economically disadvantaged students enrolled was significantly associated with a decrease in the average student growth percentile.

These findings are in line with the previous research literature indicating students' socioeconomic status impacts academic performance (Akos et al., 2015). Declines in the academic performance of economically disadvantaged students in middle school may be attributed to factors such as perceived school support (Akos et al., 2015) and insufficient school resources to support student learning progress (Alexander & Jang, 2020). While exploration of these factors is critically important to understanding the circumstances in which economically disadvantaged students perform academically, this area of focus was beyond the scope of this research study.

School-Level Structural Characteristics

Key findings emerged from analysis when controlling for school-level structural characteristics in the statistical model. First, evidence suggested per-pupil spending significantly predicted average student growth percentile in mathematics and ELA on the 2018-2019 statewide assessment after controlling for grade-level configuration. Specifically, findings revealed the average student growth percentile among seventh grade students attending schools with a kindergarten through eighth grade configuration was higher than those enrolled in schools with a traditional seventh through eighth grade-level configuration.

Results related to the grade-level configuration are consistent with the existing research literature. Three key studies concluded moving students from elementary to traditional middle schools is associated with decreases in academic achievement (Malone et al., 2020; Rockoff & Lockwood, 2010; Schwerdt & West, 2013). Rockoff and Lockwood (2010) reported school grade-level configuration is associated with student academic outcomes, yet there was little evidence that financial resources affected student achievement after controlling for grade-level configuration. Methodological differences may explain conflicting results between Rockoff and Lockwood's (2010) study and the present study.

While studies have favored the concept of K-8 grade-level configuration for supporting adolescent student learning, some debate remains. Challenges of this theory primarily surround the notion that transitioning adolescents to traditional middle school settings is cost effective (Juvonen et al., 2004). Rockoff and Lockwood (2010) found little evidence to confirm this claim. Taken in tandem, these findings suggested school grade-level configuration may influence the academic outcomes of middle school students, but the effects of financial resources require further examination.

A second key finding that emerged from this study was per-pupil spending significantly predicted average student growth percentile in mathematics and ELA on the 2018-2019 statewide assessment when controlling for school type (i.e., charter vs. noncharter schools). Specifically, the average student growth percentile was higher in charter schools than noncharter schools. These results are similar to Murphy and Izraeli's (2019) findings that charter schools in Michigan performed as well as noncharter school students on the statewide assessment. While similar to some extent, the findings from this study lifts the notion that charter school students not only performed as well as noncharter school students, but outperformed these students more specifically. It is important to note Murphy and Izraeli's (2019) study and the present study examined state assessment results across different time periods.

In contrast to Murphy and Izraeli (2019), Rapa et al. (2018) reported mixed evidence on the effects of charter school enrollment on student academic achievement. Given mixed results in the research literature, future research in this area is warranted.

Limitations

Although this study contributes to a broad body of research on the effects of school spending on student academic performance, caution must be exercised when interpreting these

results. This study has several methodological limitations. First, the design of this research study focused on the association between variables, thus causal claims could not be drawn. Second, data obtained were limited to 1 year of performance for the purposes of this study, thus impacting the strength of the study findings. Third, the choice to use Michigan school data may have limited generalizability to schools outside of Michigan. Finally, this study focused on the academic performance of seventh grade students in mathematics and ELA only. As such, generalizability of findings across all grade levels and other subject areas is limited.

Implications for Practice

The general picture emerging from analyses of the present study support claims in the existing research literature that suggest school spending is positively associated with student academic outcomes after controlling for student and school-level characteristics. Student socioeconomic status, grade-level configuration, and school type were included as covariates for seventh grade students in Michigan. These results have several implications for practice.

Implication 1- School Spending

Parallel to the claim that school spending is positively linked to improved student academic performance (Jackson, 2021) is the idea that fiscal resources must be managed effectively and efficiently (Hinojosa, 2018). Bifulco (2005) argued the cost to educate some students almost doubled the cost to educate others. The cost analysis of educating student subgroups is critical information as school accountability legislation requires a specific focus on student subgroups' academic outcomes.

Although an examination of school-level spending efficiency was excluded from this study, school and district-level leaders should be conscious of how money committed to schools through state-level funding can support learning for all student groups (Odden & Picus, 2019).

Fiscal resource allocation and application is important because money can purchase items of value (e.g., highly qualified teachers, curriculum resources, upgraded school facilities) for students' education, thereby creating opportunities for increased academic output (Baker, 2017). The consequences of school and district leaders failing to ensure financial resources are used effectively and efficiently to promote student learning may include declines in future student outcomes, and ultimately, damaged economic and societal conditions (Jackson et al., 2016; Odden & Picus, 2019). As school improvement remains a priority in Michigan, district and school leaders might benefit from developing a comprehensive system for analyzing detailed data on the use of school-level monies so that resource allocation decisions can appropriately support the effective and efficient use of state-level funds to promote student learning.

Implication 2 – Student Characteristics

Evidence from this study suggested increased school spending was related to decreased student academic growth in mathematics and ELA among economically disadvantaged seventh grade students in Michigan. A broad body of research literature has addressed the impact of student sociodemographic characteristics, particularly student socioeconomic status, on students' academic performance. Eamon (2005) reported lower income students were more likely to perform at lower academic levels compared to their higher income peers. One explanation for this finding is schools with large populations of students living in poverty typically attend schools with less funding, less experienced and qualified teachers, larger class sizes, fewer instructional resources, and outdated educational facilities (Baker et al., 2020; Bifulco, 2005). On average, these school-level inputs have been found to influence student academic performance (Bifulco, 2005). When the quality of school-level inputs is compromised, academic outputs will likely fare less favorably for historically marginalized student populations (Sosina & Weathers, 2019).

The findings from the present study support previous research and confirm the critical need to focus on the academic performance of students in poverty. As traditional middle school settings tend to draw students from a larger geographic area, the student population may be more diverse (Rockoff & Lockwood, 2010). As such, educating subgroups of students has become increasingly important. Students facing economic hardships would benefit from educational leaders aligning instructional supports with students' diverse needs based on focused and consistent data analysis. Research has suggested one way to promote alignment is to conduct a school-level budget model that concentrates funds in the investments of human and capital resources to support student learning (Odden & Picus, 2019).

Implication 3- School Structure

Findings from this study related to spending and school structure present implications for practice. Evidence from this study supported existing claims that grade-level configuration should be explored as a viable option for improving the academic performance of middle school students. Three key studies support the notion that grade-level configuration is positively linked to the academic performance of middle school students (Malone et al., 2020; Rockoff & Lockwood, 2010; Rubenstein et al., 2009). In fact, school grade-level configuration is often related to school operational structures such as school and class size, promoting a process in which to connect school site-level inputs to student outputs (Rubenstein et al., 2009).

Given the sparse research literature related to the intersection between grade-level configuration, site-level per-pupil spending, and student academic growth as an outcome measure, educational leaders in Michigan should view the findings from this study as an entry point for further exploration on school-level design. While research is emerging in this area, existing literature makes a compelling case for a kindergarten through eighth grade structure to support

improving academic outcomes of adolescent learners in Michigan. It is important to note school grade-level considerations are likely to occur due to the increased demand for accountability. If this is the case, educational leaders should commit to examining both academic and economic impacts of such a school reform strategy.

Implication 4 – School Governance

Finally, findings from this study related to spending and school governance presents implications for practice. Evidence from this study suggested school spending was positively associated with student academic growth when controlling for charter school status. Findings in existing research literature suggests mixed results. For example, two key studies reported students attending charter schools perform as well as students attending traditional public schools (Dobbie & Fryer, 2009; Murphy & Izraeli, 2019). In contrast, Betts and Tang (2008) reported the effects of enrollment in charter schools on middle school reading were inconclusive. It is important to note the methodological differences (i.e., inclusion of different variables) between these studies and the present study that may account for divergent findings. Nevertheless, the results from these studies are important to consider within the context of the present study.

As school accountability policy places a greater focus on site-level performance (Bae, 2018), school reform will remain critically important in Michigan. The education community is seeking ways to improve student academic performance across all grade levels. Given this sense of heightened focus, the results of this study should serve as another entry point for critical discussion related to school reform among middle school students. As education reform strategies should yield improvements, educational leaders should consider school governance options that lead to high impact positive changes in student academic performance. The effects of charter

school enrollment on student academic performance in Michigan continues to be an area of focus for researchers.

Implications for Theory

Given schools' roles within society and their interdependence on the broader external environment, the OST has impacted thinking about how schools operate. Evidence has suggested school-level inputs are linked to student outputs (Rebell, 2017). This relationship remains critically important given the school accountability environment. The school accountability movement provides a strong example of how schools' organizational behavior is transformed to demonstrate a relationship between inputs and outputs given the external environment's multilevel demands (Bastedo, 2004). Public schools as open systems ensure a societal lens remains at the forefront of these governmental institutions and that feedback is obtained through this interaction with the broader environment.

Conclusion

This study filled the gap in the research literature by addressing the relationship between school-level spending and the academic growth of seventh grade students in Michigan within the school accountability context. Results revealed site-level per-pupil spending was positively linked with average student growth percentile of seventh grade students in mathematics and ELA when including student and school-level descriptors as covariates in analyses.

Although a causal relationship could not be established, the results from this study are significant for several reasons: (1) the results support arguments that fiscal resources are positively related to improved student academic outcomes, (2) student academic growth was used as the outcome measure rather than proficiency as an alternative method for examining the effects of school spending, (3) the focus on middle school students expands the limited body of research on

this historically low performing group of students, and (4) findings confirm the influence of student sociodemographic and school-level structural characteristics on student academic performance.

Today's policymakers, practitioners, and researchers understand the academic performance of public school students matter during and beyond the K-12 experience. The emphasis on improving student outcomes has led to decades of school accountability policy and school finance reform efforts. Although future research must establish further generalizability of these results, the present study has provided clear support for the argument favoring the positive association between school fiscal resources and student academic performance. As such, policymakers are urged to develop policies that hold district and school leaders accountable for the effective and efficient use of state educational dollars. District leaders would benefit from working collaboratively with school leaders to establish and ensure district-wide systems are in place to regularly and consistently use multiple forms of data to inform fiscal resource allocation and application.

Recommendations for Future Research

More work is needed before obtaining a full understanding of the extent of school-level spending effects on student academic growth. As such, four recommendations for future research directions are presented in this section. First, with current school accountability placing a greater focus on student academic growth as the outcome measure, future research efforts should shift the focus from examining student proficiency to investigating growth-based measures. This would make research findings timely and relevant within the school accountability context.

Next, research should explore the association between school-level expenditures, classroom level academic performance, and academic growth on state-level assessments. This would provide state, district, and school leaders with a more comprehensive understanding of the

effects of education funding on the learning environment. Third, analyzing data across multiple years may be worthwhile to extend findings on the association between school-level spending and student academic growth on statewide assessments. Specifically, trend data may strengthen research findings. Finally, although findings from this study only reflected seventh grade mathematics and ELA, research studies geared toward investigating the effects of school spending on student academic growth for additional grade levels, subject areas, and locales throughout the United States may maximize generalizability of findings presented in this study.

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ABSTRACT

THE ASSOCIATION BETWEEN SCHOOL SPENDING AND ACADEMIC GROWTH AMONG 7TH-GRADE STUDENTS IN MICHIGAN

by

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The purpose of this quantitative ex-post facto research study was two-fold: (a) to investigate the association between school spending and student academic performance, and (b) to identify the student sociodemographic and school-level structural characteristics that mediated a relationship. Multilevel linear regression models were estimated to identify the association between total site-level per-pupil expenditures and school aggregated student academic growth measures in mathematics and ELA among 7th-grade students in Michigan for the 2018-2019 academic year. The data for 803 traditional public and charter public-school academies from 667 districts in Michigan were collected from Michigan's Center for Educational Performance and Information (CEPI). The primary findings revealed that after controlling for student sociodemographic and school-level structural characteristic variables, on average, higher levels of per-pupil spending were associated with higher student growth percentile in mathematics and ELA. Specifically, a $1,000 increase in the level of per-pupil spending was associated with increases in the student growth percentile in mathematics and ELA. This study contributes to the

existing body of research literature examining school fiscal resources and student academic outcomes. Theoretical and practical implications are discussed.

AUTOBIOGRAPHICAL STATEMENT

Goal accomplishment in life is a manifestation of one's life purpose. Purpose in life is defined as the central objectives motivating one's life decisions, behaviors, and meaning. The journey to fulling God's purpose for my life has been greater than accomplishing any one goal. I believe the quest for purpose in life is rooted in key foundational elements. These essential elements have helped to shape and refine me while I traveled life's journey. I believe the three most important factors in fulling my purpose in life are family, focus, and faith.

A family's influence on one's life significantly impacts how one sees themselves. Growing up, I witnessed what hard work, perseverance, commitment, and sacrifice meant. As the fourth of four children born to a mother driven to make a suitable life for her and her children, I learned that earning an education was important. This life lesson began early for me. As a young child, I eagerly attended college classes in the evenings with my mother. I quietly observed her balance work, school, and home life. From that, I understood that success was secondary to hard work. The example set by my mother inspired me to dream big and prepare earnestly to obtain my goals.

Goal attainment requires focus. That focus included creating a solid foundation by pursuing educational opportunities that resulted in obtaining my bachelor's, master's, and ultimately, a doctoral degree. These opportunities led to a rewarding career where advancement became the norm. The ability to focus on my dreams meant that I had to significantly rely on my greatest source of strength, my faith.

The person I am today is rooted in my unwavering faith in God. It is because of God's grace and mercy that I was able to do exceedingly and abundantly above all that I could ever imagine. The person I am today is only a microcosm of who I will become. For that, I thank God in advance.