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Student Achievement as an Investment in Human Capital: Using Longitudinal Patterns of Per Pupil Instructional and Capital Expenditures, Socioeconomic Status, and Past Performance in Predicting Student Achievement

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STUDENT ACHIEVEMENT AS AN INVESTMENT IN HUMAN CAPITAL: USING LONGITUDINAL PATTERNS OF PER PUPIL INSTRUCTIONAL AND CAPITAL EXPENDITURES, SOCIOECONOMIC STATUS, AND PAST PERFORMANCE IN PREDICTING STUDENT ACHIEVEMENT

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ABSTRACT

STUDENT ACHIEVEMENT AS AN INVESTMENT IN HUMAN CAPITAL: USING LONGITUDINAL PATTERNS OF PER-PUPIL INSTRUCTIONAL AND CAPITAL EXPENDITURES, SOCIOECONOMIC STATUS, AND PAST PERFORMANCE IN PREDICTING STUDENT ACHIEVEMENT

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Existing research illustrating a significant relationship between school spending and student achievement is expanding. However, research specifically investigating the relationships between capital expenditures (maintenance, renovations, and construction) and instructional expenditures (teacher quality, teacher salaries, textbooks, class size) with student achievement both individually, and as a function of overall school spending, is lacking. Recent studies have linked school spending to student achievement in an attempt to increase school funding as a response to No Child Left Behind Act (2001) mandates. This study attempts to augment this area of inquiry by providing feedback across the Commonwealth of Virginia on longitudinal patterns of student achievement as a function of longitudinal patterns of instructional and capital expenditures per pupil.

This dissertation is dedicated to my two favorite girls - my daughters:

Marley S. Roberts – "Poosha"

and

Hunter R. Roberts – "Bear"

Their infinite curiosities have inspired me to continue in the tenacious pursuit of meaning and understanding. Daddy loves you, always.

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Bruce A. Roberts, Jr. and Rhonda D. Roberts,

and to my uncle:

Eric R. Maul – "Uncle Blue"

Their unyielding encouragement and support of my educational endeavors has been a constant source of motivation. Many thanks to them and to the rest of my family!

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CHAPTER 1: INTRODUCTION

Overview

This dissertation is being written to strengthen the field of empirical research that investigates the relationship between school district expenditures per pupil and student academic achievement. This introductory chapter discusses the background of such expenditures and discusses the relationships in general, and as a function of the No Child Left Behind Act of 2001. Current and past research will be discussed with respect to identified school district expenditure categories, and will form the conceptual model of the study. At the conclusion of this chapter the problem statement and the purpose of the study will be presented, concluding with the research question, expectations, limitations of the study, and definitions of key terms. The literature review follows in Chapter 2, followed by the methodology of empirical investigation in Chapter 3, the results thereof in Chapter 4, and a discussion in Chapter 5.

Background

As the United States strives to maintain its position in an expanding global economy, education is at the forefront of a complex social, political, and economical movement. In support of this movement, the No Child Left Behind Act of 2001 (NCLB) established a comprehensive system of educational accountability that holds teachers, principals, superintendents, school boards, and state departments of education collectively responsible for student successes and failures.

The No Child Left Behind Act is based on four pillars: stronger accountability for results; more freedom for states and communities; proven education methods; and more choices for parents - and the United States Department of Education has endorsed the following key benefits of implementing these pillars (Four Pillars of NCLB, retrieved from www.ed.gov/nclb/overview/intro/4pillars.html):

Funding: Provides increased federal funding allocations.

Flexibility: Gives states and schools more flexibility over funding decisions.

Accountability: Schools and school districts are held accountable for results and are responsible for making sure every child is learning.

School District Report Card: Parents are informed of which schools in their district are succeeding and why – thus providing parents, community leaders, teachers, principals, and elected leaders with the information they need to improve schools.

Public School Choice: Provides options with school choice as parents may transfer their children to another public school if their school does not meet the standards.

Extra Help with Learning: May provide children of schools "in need of improvement" with free tutoring.

Parental Involvement: Schools are required to develop ways to get parents more involved in their child's education and school improvement.

Measuring Knowledge: Testing in reading and math every year in grades 3-8 to help parents, teachers, and children monitor student achievement.

Scientifically Based Research: A focus on teaching methods that have been proven to work through research thereby reducing the implementation of educational fads.

Reading First: Provides more than one billion dollars annually to help children learn to read on grade level by the third grade.

Teacher Quality: Provides funding to help teachers learn to be better teachers.

The broad goals of NCLB are to raise student achievement levels and to close the achievement gap that parallels race and class distinctions by refocusing schools' attention to improving test scores, providing parents with more educational choices, and ensuring better-qualified teachers (Darling-Hammond, 2007b). However, one of the major side effects of NCLB is that it does not provide substantial investments in under-resourced schools, does not require that states provide equitable and adequate funding to achieve

these broad goals, and largely ignores the resources necessary to achieve the very quality education it is mandating (Darling-Hammond, 2007b). For this reason numerous research endeavors have been undertaken to examine the relationships between various layers of public school funding, subsequent expenditures, and their combined and individual effects on student academic achievement. This research further investigates these relationships.

The importance of education finance becomes more relevant after further examination of the eleven implementation benefits endorsed by the United States Department of Education as previously itemized above. Ten of the eleven benefits (91%) impose significant financial burdens on school districts. The school district report card is the only benefit that does not constitute more than a trivial administrative cost. It is this financial burden that many researchers continue to investigate in their efforts to correlate increases in education funding with increases in student academic achievement.

To complicate this burden, existing levels of education funding have been found to be inadequate for student achievement. This inadequacy was shown to be disparate across socioeconomic strata, resulting in the implementation of funding formulae which serve to equalize educational funding across local, state, and federal levels. Fiscal equalization is possible when local school districts have equal resources, show equal effort to fund their schools, and spend what is necessary to educate students with special learning needs (Owings & Kaplan, 2006, p. 206).

This inadequacy in funding leads to numerous attempts to quantify the cost of public education. Reschovsky and Imazeki (2001) posited that to impose student performance standards without simultaneous implementation of school finance reform, will "result in a situation where school districts with above-average costs will not have enough resources to educate their students to meet the new standards" (p.375). Their research is discussed further in chapter 2.

More than two-thirds of state education officials recently cited inadequate federal funding under NCLB as an obstacle to assisting schools make adequate yearly progress (Duncombe, Lukemeyer, & Yinger, 2008). Because failure to meet adequate yearly progress requirements will ultimately lead to reduced funding sanctions under NCLB, states will try to avoid these sanctions by either setting low standards for student performance, or by setting high standards and significantly raising state and/or local taxes to ensure that these standards can be reached (Duncombe, Lukemeyer, & Yinger, 2008). This underscores conclusions drawn by several works cited in this writing: that NCLB does not provide the funding needed to meet its own objectives and jeopardizes the very levels of student achievement it aims to increase. The underlying premise of this research is captured by these conclusions.

Harter (1999) posits that a direct relationship exists between school spending to support teaching and learning, the value placed on the school itself, and the quality of the education being offered. The importance of education funding thus becomes tangible when you question the professional and moral commitment to education of a school

district that attempts to provide highly qualified staff in schools that are found to lack the fiscal ability to maintain adequate facilities, provide proper supplies, incorporate innovative technology, or provide an effective, enriching curriculum.

Conceptual Framework

The research expectation of the conceptual framework for this study is that longitudinal patterns of per-pupil expenditures at the district level are associated with longitudinal patterns of student achievement. Analogous to the conceptual framework, the expectations further state that in districts divided along lines of expenditure patterns, longitudinal patterns of district wide per-pupil expenditures are positively associated with longitudinal patterns of district-wide student achievement; and that historical academic achievement is associated with future academic achievement.

The conceptual framework incorporates research conducted in education that investigates school funding, school spending, and the complexities of defining and establishing a benchmark level of the two as it relates to student academic achievement. The model suggests that several types of expenditures are necessary to provide the opportunities necessary for a total educational experience. This experience has been shown in the literature to influence educational outcomes and is continually examined throughout this writing.

The problem under NCLB is that the stipulations attached to the dollars relied upon by poorer school districts are actually very costly to achieve - resulting in

expenditure increases per pupil simply to implement the programs required to achieve the goals of the Act and to ultimately receive the needed dollars. Unfortunately, this is often at the sacrifice of the very programs for which the additional money could have initially been used. Because education is a state responsibility and funding for education is primarily a local responsibility, any financial assistance from state or federal coffers is often subject to underfunded or unfunded mandates (Duncombe, Lukemeyer, & Yinger, 2008; Frazier, 1993).

Additionally, the best-resourced schools are typically not close to the inner city or to poor rural neighborhoods where struggling schools are concentrated. As a result the Act fails to expand educational opportunities for low-income students in many communities, fails to provide substantial investments in those under-resourced schools, and fails to require that states demonstrate progress towards equitable and adequate funding for greater opportunities to learn (Darling-Hammond, 2007b).

Increased spending is assumed to lead to increased student achievement because it funds instruction, resources, and opportunities to learn (Elliott, 1998), positively influences student-teacher ratios (Wenglinsky, 1997), provides the salaries required to recruit exceptionally qualified teachers (Darling-Hammond, 2007a; Roza & Hill, 2004; Wenglinsky, 1997), provides adequate facilities in which to engage in effective pedagogy (McGuffey & Brown,1978; O'Neil & Oates, 2001), provides art, music, and physical education programs (Slavin, 1999), helps to narrow the digital divide between schools with access to technology and schools without such access (Huang & Russell, 2006), and

reduces teacher turnover as they begin to approach seniority and gradually become excellent teachers (O'Neil & Oates, 2001; Wenglinsky, 1997; Wenglinsky, 1998).

Additionally, investing in education is considered an overall investment in human capital as education increases employability, income levels, voting frequency, volunteerism, charitable contributions, leisure and cultural activity participation, and prenatal care; while decreasing incarceration rates, health insurance, out-of-wedlock childbirths, and crime victimization (Owings & Kaplan, 2004).

There are several types of expenditures that affect the way students learn and, therefore, several types of funding. The most recent analysis of funding initiatives implemented by the 50 states was conducted by Crampton (2007) where he found that in 2000, there were 448 school funding bills in support of improving student achievement and teacher quality that became law. Inclusive of these laws were emphases on finance legislation, infrastructure funding, educational technology funding, charter school funding, student achievement funding - to include extended, summer, and after-school programs - and teacher quality funding. It follows that instructional practices should have the most affect on academic achievement, but existing research suggests that interactions between direct instructional expenditures and other, tangential expenditures such as those investigated by Crampton, actually increase the power of the effects of all spending on academic achievement (Bodovski & Farkas, 2007; Heck, 2007; Odden, Goertz, Goetz, Archibald, Gross, Weiss, & Mangan, 2008; Wall, 2006). This finding

underscores the relevance of the conceptual model presented in Figure 2 and is examined later in the chapter.

Instructional expenditures are those costs that school divisions spend on teaching and teacher preparation; with non-teacher specific expenditures playing a peripheral, yet equally important role. Referencing the School Expenditure Structure and Resource Indicators derived by Odden, et. al. (2008), Figure 1 illustrates categorical instructional expenditures and includes: core academic teachers, specialists and elective teachers, planning and preparation, extra help, professional development, other non-classroom instructional staff, instructional materials and equipment, and student support services. Expenditures for teaching and teachers require the most resource indicators, and core teachers comprise the largest portion of school-based expenditures per pupil (Odden, et. al.).

Additional instructional spending may include teacher training as a viable category. Previous studies have attempted to show that increasing teacher training, certification, and experience is the best way to prepare effective teachers because it augments their pedagogical skills and abilities, which ultimately results in higher student achievement (Fetler, 1999; Heck, 2007; Laczko-Kerr & Berliner, 2002; Powers, 2004; Vandevoort, Amrein-Beardsley, & Berliner, 2004; Wall, 2006). How does one define and quantify acceptable levels of teacher proficiency? Because *teaching skill* is difficult to define and quantify, researchers and policymakers, "use teacher education and experience as plausible proxy measures" (Fetler, p.1). As techniques to assess teacher

skill continue to be defined, developed, and disseminated, arguments for gauging teacher proficiency by solely investigating passing rates of students on standardized tests have increased exponentially as a result of school districts' efforts to meet Adequate Yearly Progress under NCLB.

School Expenditure Structure	
Instructional	**1. Core Academic Teachers** - English / Reading / Language Arts - History / Social Studies - Math - science **2. Specialist and Elective Teachers / Planning and Preparation** - Art, music, physical education, etc - Academic Focus with or without Special Funding - Vocational - Drivers Education - Librarians **3 Extra Help** - Tutors - Extra Help Laboratories - Resource Rooms (Title I, special education or other part-day pupil-out programs) - Inclusion Teachers - English as a second language classes - Special Education self-contained classes for severally disabled students (Including aides) - Extended Day and Summer School - District-Initiated Alternative Programs **4 Professional Development** - Teacher Time - Substitutes and Stipends - Trainers and Coaches - Administration - Materials, Equipment, and Facilities - Travel and Transportation - Tuition and Conference Fees **5 Other non-Classroom Instructional Staff** - Coordinators and Teachers on Special Assignment - Building Substitutes and Other Substitutes - Instructional Aides **6. Instructional Materials and Equipment** - Supplies, Materials, and Equipment - Computers (hardware, software, peripherals **7. Student Support** - Counselors - Nurses - Psychologists - Social Workers - Extra-Curricular and Athletics
Non-Instructional	**8 Administration** **9 Operations and Maintenance** - Custodial - Utilities - Security - Food Service

Figure 1. School Expenditure Structures and Resource Indicators.
Odden et. al. (2008) The cost of instructional achievement: resource allocation in schools using comprehensive strategies to change classroom practice. *Journal of Education Finance, 33* (4), 384.

Just as important are studies that address instructional spending as a function not of the teacher, but of the appurtenances of the teaching realm: school calendars, textbook spending, student-teacher ratios, learning environment, district size, length of the school day, instructional approaches, auxiliary teaching staff, and manipulations of the definitions of "proficiency" to gauge acceptable levels of yearly progress and subsequent staffing decisions (Bodovski & Farkas, 2007; Duncombe, Lukemeyer, & Yinger, 2008; Odden, et. al., 2008; Powers, 2004; Wall, 2006).

With respect to funding for public school capital construction, renovation, and maintenance projects, meticulous planning, forethought, careful calculation, and impeccable timing is required. However, Thompson, Stewart, and Camp (1989) maintain that the problem of how to adequately and equitably fund school facilities is growing nationwide. Students and teachers continue to operate in physical environments that adversely affect their health and morale, making the capital and maintenance budgets of paramount importance (Frazier, 1993).

The capital improvement plan (CIP) is a locality based plan typically written every 10 years and assesses long-term need for funding major construction projects within the school district every 5 years. It is updated yearly to ensure planning, programming, and budgeting needs coincide with planned project feasibility. The maintenance reserve budget is also locality based, however, is funded yearly, and provides funding for unforeseen, preventive, and routine maintenance projects.

An extensive amount of literature has also been written linking student achievement to socioeconomic status (Chiu & Khoo, 2005; Sirin, 2005; Stinebrickner & Stinebrickner, 2003; Sutton & Soderstrom, 1999; Toutkoushian & Curtis, 2005) and school financing (Harter, 1999; Slavin, 1999; Wenglinsky, 1998). Often the literature includes ancillary mention of the physical conditions in which low performing schools must operate, but fall short of statistically attempting to correlate such a performance malady with the actual condition of the physical building (Rothstein, 2000). Earthman (1985) has written extensively on this subject yet surrenders that, "... the role of the school facility on the educational process is beginning to be better defined, but much more research needs to take place to bring this relationship into focus" (p. 16). This study is an effort to bolster the dearth of empirical investigation that still exists in the literature today.

There are some experts who dismiss funding differences as a contributing factor to the successes or failures of certain school districts by concluding that there is little to no relationship between building condition and academic achievement (Picus, L. O., Marion, S. F., Calvo, & N., Glenn, W. J., 2005). Their position is that money cannot improve test scores – that better texts, equipment, resources, facilities and an overall better learning environment will not make a difference in student success or failure. This study investigates the feasibility of their position.

The model adapted in this work also examined longitudinal patterns of student achievement in an effort to associate past performance with future performance. Several

recent studies examined factors that predict student achievement. Standardized tests (DeBerard, Spielmans, & Julka, 2004; Garavalia, Gredler & DeBerard, 2002; Kaplan, 1993; Sanderson, 2004; Scott & Delgado, 2006), student transience (Sanderson, 2004), academic grade point average (DeBerard, Spielmans, & Julka, 2004; Garavalia & Gredler, 2002) and cognitive ability (Scott & Delgado, 2006) have all been studied with regard to their predictive effects on student achievement. These studies support the current research expectations as discussed in Chapter 2.

Akin to these studies are empirical examinations of high school dropout rates that offer varying theoretical perspectives for why our children are not graduating. Because gaps exist in the current research that focuses mainly on students who do not graduate when they are supposed to, Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins (2000) examined five theories to predict tendencies to drop out of school before the 10^{th} grade - citing this as the critical grade in which most dropouts exit the school system. The five theories are: general deviance (deviant behavior or sexual involvement), deviant affiliation (relationships with antisocial peers), poor family socialization (low parental expectations and parental educational attainment), structural strains (gender, ethnicity, socioeconomic status), and full academic mediation (the extent to which prior academic achievement acts as a covariate with the previous four theories). The results of their research indicated that under all theoretical models tested, poor academic achievement was the strongest predictor of high school dropouts prior to the

10^{th} grade. The conceptual framework of this writing therefore incorporates student performance into the model.

One of the key components of the No Child Left Behind Act of 2001 is the requirement for accountability. Schools and school districts are held accountable for student achievement and are responsible for making sure every child is learning at the required levels. The problem with this general requirement is that it neglects to account for child socioeconomic factors outside of the control of the school district. While the Act incorporates mechanisms for general increased funding, tutoring incentives, and funding to help shape better teachers, the social conditions that exist in poverty stricken communities are ignored.

Significant research exists that shows a positive statistical relationship with socioeconomic status and student achievement. Unemployment rates, adult education, and parental income have been shown to account for over 50% of the variation in average standardized test scores in a study of all public high schools in New Hampshire (Toutkoushian & Curtis, 2005). These effects have also been shown to transcend national boundaries. In a study of high school students from 41 countries Chiu and Khoo (2005) found that students with more access to government, family, and school resources scored higher in reading, mathematics, and science, in all countries within the study. Interestingly, this study also found that parents' socioeconomic status affected student achievement thereby underscoring the fact that poverty as an institution is cyclical and difficult to overcome.

Impoverished students are more likely to underachieve than their middle and upper income peers. These children enter school with insufficient skills, tend to remain behind for the duration of their educational experience, and are at a higher risk of dropping out than those with a higher socioeconomic status (Arnold & Doctoroff, 2003; Taylor, 2005). This study served to contribute to the body of knowledge that finds socioeconomic status to be a significant component of any research involving student achievement.

Conceptual Model

The conceptual model employed by this design assumes that existing research shows a significant relationship between socioeconomic status, total per-pupil expenditures, and past student achievement, as will be supported in detail in Chapter 2 of this writing. Figure 2 illustrates this model and shows the paths taken toward student achievement. Because the primary focus of this writing is the criterion variable, student achievement, it is also the primary focus of the model. Interactions with student achievement are indicated by directional arrows and demonstrate the paths of the predictor variables to the criterion variable.

According to the model, local per-pupil instructional expenditures, local per-pupil capital expenditures, socioeconomic status, and past performance are shown to have a direct influence on student achievement. However, per-pupil instructional expenditures, and per-pupil capital expenditures are shown to have a bidirectional relationship with

student achievement due to research showing that increased student achievement leads to increased student expenditures especially since the funding formulas under NCLB provide additional funding for those schools whose students meet or exceed adequate yearly progress. What is of particular interest is that in order to receive the additional funding and subsequent increase in per-pupil expenditures, students have to satisfactorily achieve in the first place. The conundrum exists in the infinite, circular relationship that is formed as a result.

This shows that socioeconomic status, conceptually captured in high versus low average expenditure school district data, has a direct relationship with student achievement. Factors affecting socioeconomic status - poverty, access to educational resources, delinquency, and home environment – all contribute to children's propensity to achieve. This model also shows a direct relationship between socioeconomic status and all per-pupil expenditures. This relationship exists as a function of Virginia's local funding formulae being dependent upon the wealth of the local district, or the *composite index,* in which the school is located.

The composite index is based on sales tax (figured at 10%), income tax (figured at 40%), and property tax (figured at 50%) and is translated into a representation of each locality's capacity to pay. Districts with a lower capacity to pay will receive more funding than districts with a higher capacity to pay. On the surface it appears as though this effort equalizes the playing field, however, research continues to show that funding equity does not automatically result in funding adequacy (Books, 1999; Chou & Khoo,

2005; Condron & Roscigno, 2003; Rossmiller, 1994; Soderstrom, 1999). More specifically, districts with more wealth receive more funding due to the localities' ability to use alternative resources to augment the funding provided by local tax revenue and the federal government.

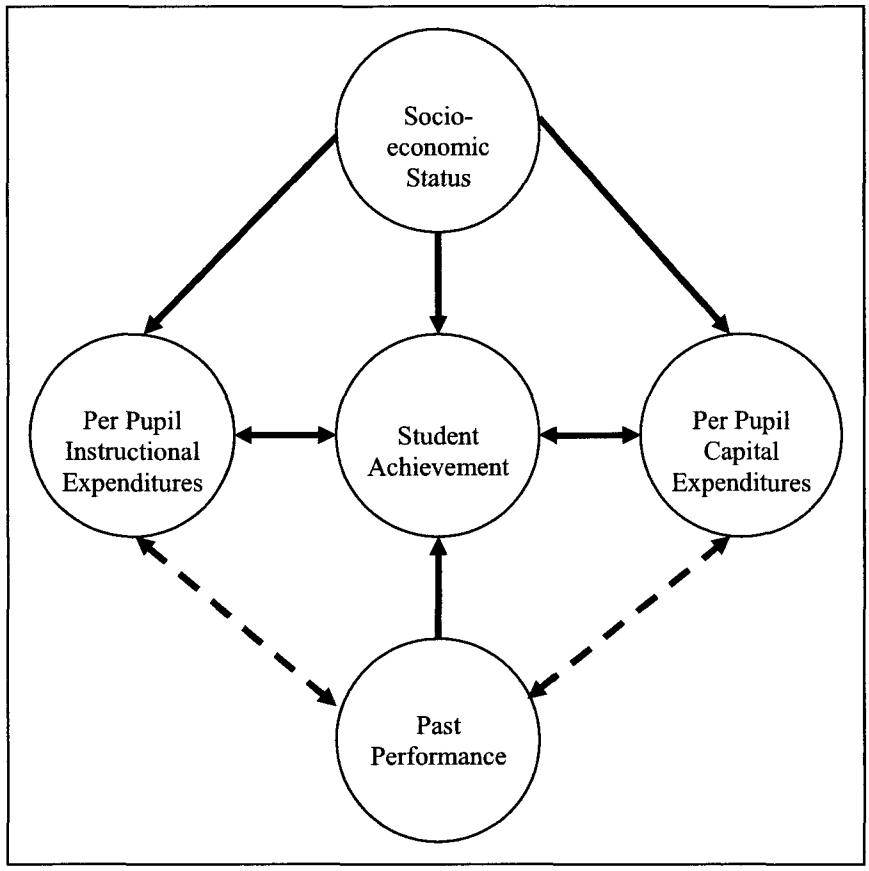

Figure 2. Conceptual Model of Achievement

Statement of the Problem

The fundamental problems this research addresses are the relationships between longitudinal per-pupil capital and instructional expenditure patterns, and their individual and combined effects on student longitudinal achievement.

The key to academic success at all levels of education is access to resources. A resource, as defined by Merriam-Webster's online dictionary is, "a source of supply or support: an available means ... a natural source of wealth or revenue ... a natural feature or phenomenon that enhances the quality of human life ... a source of information or expertise" (Merriam-Webster Online Dictionary. Retrieved from http://www.merriam-webster.com). From the kindergartener who is in need of crayons for the development of hand-eye coordination and artistic cognitive development - to the middle school student who needs books, calculators, after-hours tutoring, notebooks, paper, and pens - to the graduate student who needs access to journals, word processing equipment, or a personal computer - the common denominator remains access to resources.

The problem lies in the interaction between per-pupil spending and academic achievement with respect to the juxtapositional relationship between funding and the availability of academic resources. It can be concluded that per-pupil expenditures, as a result of funding levels, have a direct and significant relationship with academic achievement. Consequently, insufficient funding will result in inadequate per-pupil expenditures which is associated with unsatisfactory student academic achievement, and ultimately less funding.

While previous research literature documents the widespread inequalities among school districts' resource availability and subsequent distribution, lawyers in dozens of claims brought against the states have cited such literature in their demand for equitable funding practices (Elliott, 1998). Examples of this exist today with respect to: district level spending in Columbus, Ohio (Condron & Roscigno, 2003), the digital divide in Oklahoma City (Huang & Russell, 2006), access to high quality teachers in Kentucky (Knoeppel, 2007), facility conditions and teacher retention in Washington, DC (Buckley, Schneider, & Shang, 2005), nationwide access to technology (Judge, Puckett, & Bell, 2006), estimating the overall costs of an adequate education (Wall, 2006), privileged student biases on an international level (Chiu & Khoo, 2005), funding the physical environment of schools (Crampton, Thompson, & Vessely, 2004), and with respect to several other areas that will be discussed further in Chapter 2.

It is evident that the decades-old debate regarding school finance and the various theories of finance reform will not be easily resolved. However, this research will contribute to the ongoing dialogue regarding this important component of education inquiry.

Purpose of the Study

This research augments the field of empirical knowledge that demonstrates statistically significant relationships between student historical academic achievement, local per-pupil instructional expenditures, local per-pupil capital expenditures, and

socioeconomic status (conceptually captured in high versus low average expenditure school district data); and their effects on student achievement. In supporting this purpose, and the research expectations discussed previously with the conceptual framework, the following research questions have been identified.

Research Questions

1. Are increases in longitudinal patterns of per-pupil instructional expenditures associated with increases in longitudinal patterns of student achievement?
2. Are increases in longitudinal patterns of per-pupil capital expenditures associated with increases in longitudinal patterns of student achievement?
3. Are combined increases in longitudinal patterns of per-pupil instructional and per-pupil capital expenditures associated with longitudinal patterns of student achievement?
4. How do the effects of longitudinal patterns of student achievement differ as a function of longitudinal expenditure patterns?
5. Can past student academic performance be used to predict future student academic performance?

As stated previously, the expectation of the conceptual framework for this study was that longitudinal patterns of per-pupil expenditures at the district level are associated with longitudinal patterns of student achievement. Additionally, it was expected that in

districts divided along lines of average-expenditures , longitudinal patterns of district wide per-pupil expenditures are positively associated with longitudinal patterns of district-wide student achievement. Lastly, it was expected that historical academic achievement is associated with future academic achievement.

Limitations and Assumptions

The population that was studied in this research included all third grade elementary school students and eighth grade middle school students enrolled in the 132 school districts in the Commonwealth of Virginia public schools, and quantified in the fall membership counts from 2001 through 2010. This may limit generalizing beyond Virginia due to funding variations that exist throughout the country.

Because school divisions are being investigated as a whole, it is possible that a threat to statistical conclusion validity exists due to the absence of individual student data variables. This will limit the ability to fully partition the variance of the outcomes.

Threats to internal validity may emerge due to the longitudinal nature of the study because changes to student achievement may be a function of maturation and differential attrition due to high levels of student transience (Sanderson, 2004), and other confounding variables that may not be controlled for in the research methodology.

While this model regards socioeconomic status and previous academic achievement as confounding variables, it is acknowledged that other confounding variables may contribute to any change in the criterion variable, student academic

achievement. Such confounding variables are: teacher effectiveness, emotional stability, parent's educational attainment, overall health, family cohesiveness, extracurricular environment, self-esteem, motivation, and personal fulfillment. However, identifying and examining these and other possible covariates is external to the purposes of this research endeavor.

Definition of Key Terms

Throughout this dissertation key terminology was utilized that may translate differently for different readers and researchers. For this reason a list of key terms is included below with their definitions as used in this writing.

Academic Achievement: Because Virginia has administered Standards of Learning (SOL) assessments in reading and mathematics since 1998, it provides useful data for making long-term comparisons of school improvement (Kim & Sunderman, 2005). Because of this established legitimacy, achievement in this writing refers to student SOL scores.

Per-pupil Expenditures: As a function of the representative schools' total budget divided by the number of children enrolled in the school at the time of the study, per-pupil expenditures are the total annual amount of money spent per-child on all school functions combined, expressed in thousands of dollars (Condron & Roscigno, 2003). This research assumed that the totality of funds made available for a school were used to support students

whether directly or indirectly.

Per-pupil Instructional Expenditures: Those monies budgeted for core academic teachers, specialists and elective teachers, planning and preparation, extra help, professional development, other non-classroom instructional staff, instructional materials and equipment, and student support services. Expenditures for teaching and teachers require the most resources and core teachers comprise the largest portion of school-based expenditures per pupil (Odden, et. al. 2008).

Per-pupil Capital Expenditures: The representative schools' yearly budget for capital expenditures over the 10-year period of the study, divided by the number of children enrolled in the school during the year being studied. Because capital outlay plans are typically conducted in 5 year increments, it was prudent to examine a total of 10 years of data to capture the effects of capital spending, which manifest themselves a few years after initial funding and expenditure. This should increase the validity of the measurement.

Socioeconomic Status: Typically determined based on the percentage of students in a school district who receive free or reduced lunch – as this is directly related to the income of the students' parents (Sirin, 2005; White et al., 1993). However, for the purposes of this study, school divisions were divided along yearly instructional and capital expenditures. Those

divisions that spent less than the mean for that year were considered low expenditure divisions, while those that spent more than the mean for that school year were considered high expenditure divisions. Baseline expenditure amounts for capital and instructional expenditures in 2001 were calculated and the difference between this baseline and the same expenditures at the end of the study in 2010 was obtained. This established a "baseline gain" figure that further categorized division expenditures along low gains or high gains, relative to the mean of school divisions for that year. This allows investigation not only of longitudinal mean division expenditures over the 10-year period of the study, but also of significant increases or decreases in expenditures that mean data cannot account for.

Historical Academic Achievement - Because Virginia has administered similar state Standards of Learning (SOL) assessments in reading and mathematics since 1998, it provides useful data for making long-term comparisons of school improvement (Kim & Sunderman, 2005). Historical academic achievement in this writing is therefore be defined as student SOL scores in the third grade, as this is the first year in which SOL tests are administered. Because this study examined achievement in the third and eighth grades, third grade SOL scores were the only measure of historical achievement available, and were compared to eighth student

grade achievement 5 years later.

Elementary School – Defined as any public school in the Commonwealth of Virginia that houses grades kindergarten through fifth grade.

Human Capital – Defined as a measurement of societal value in the context of educational attainment. Employs the belief that educating citizens would benefit society's overall economy and safety, and increase the quality of life for individuals and the society at large (Owings & Kaplan, 2004).

Summary

The United States spends an enormous amount of money on education. Although not specifically mentioned by the United States Constitution, and therefore reserved as a State function under the 10th Amendment, the provision of a free, public education for all citizens was nevertheless found to be a significant and critical component of American prosperity by the individual states. In fact, the states felt so compelled to provide this service that over 91% of the estimated $1 trillion spent on all levels of education for the 2007-2008 school year were financed by non-federal sources (Snyder & Dillow, 2011).

America's global wealth, educational prowess, and technological superiority are beginning to wane in comparison to other developed nations, however, and strategies on how to better prepare our children to be more competitive in an evolving global economy are beginning to gain importance. One of the strategies implemented to address this trend

was the federal government's institution of the No Child Left Behind Act of 2001 (NCLB).

NCLB established a system of educational accountability encompassing all professionals in the field. Teachers, principals, superintendents, schools boards, and state departments of education are all responsible for student success, and are now held accountable for their failures. However, many states have been faced with obstacles in complying with this initiative due to inadequate or absent funding. To complicate the matter, funding formulae have been shown to be inadequate not only across school districts, but within school districts. Not only is NCLB imposing unfunded and underfunded mandates on the states, it is facilitating spending discrepancies that are leading to per-pupil expenditures that are inadequate for attaining the very level of quality education that it is designed to accomplish (Duncombe, Lukemeyer, & Yinger, 2008; Reschovsky & Imazeki (2001).

This dissertation strengthens existing research that attempts to show a statistically significant relationship between per-pupil spending and student achievement. In investigating the predictor variables; local per-pupil capital expenditures, local per-pupil instructional expenditures, socioeconomic status, and past performance, it was expected that a statistically significant, positive association existed between these variables and the criterion variable; student academic achievement.

The next chapter reviews significant research in the field with respect to socioeconomic status and its effect on student academic achievement; per-pupil capital

expenditures and the effects of building conditions and physical environment on student academic achievement; total per-pupil expenditures and its effect on student academic achievement; and the predictability of academic achievement based on past performance.

CHAPTER 2: LITERATURE REVIEW

In augmenting the pool of research that examines the effects of spending on student academic achievement, a focused review of the existing literature is warranted. This review examines the learned research conducted with respect to the primary topic of inquiry: per-pupil spending and its effect on student academic achievement, per-pupil capital spending and its effect on student academic achievement, and per-pupil instructional spending and its effect on student academic achievement. Subordinate to the primary topic of inquiry are two secondary areas of investigation that served as covariates in an attempt to control for the confounding variables, *prior achievement (*and its effect on future academic achievement), and *socioeconomic status* (and its effect on academic achievement). Because insufficient empirical research exists that specifically investigates past performance as a predictor of future performance, this review examines overall achievement and its effect on future academic success. Overall achievement was defined by standardized test scores and high school graduation rates, as will be discussed further in Chapter 3.

Socioeconomic Status

In a finance equalization study, Wenglinsky (1998) found that spending on instruction and capital expenditures was significantly related to differences between socioeconomic groups – lower spending levels were found to be associated with greater

achievement gaps within schools nationwide. The researcher points out that legislation attempts to equalize inequities between school districts do not address the inequities *within* school districts in that funding can still be disparately distributed once they get within the school system itself. Wenglinsky further concluded that when schools lack sufficient funds, their capacity to educate all students toward a common measure is reduced. This reduction has potentially serious ramifications with respect to satisfying achievement requirements under NCLB.

These findings are related to earlier research in which Wenglisnky (1997) found that mathematics achievement was significantly associated with school environment; which was significantly associated with teacher-student ratios; which was significantly associated with higher levels of teachers' education; which was significantly associated with instructional spending; which was significantly associated with student achievement - thereby creating a perpetual circular relationship.

Impoverished students are more likely to underachieve than their middle and upper income peers. These children enter school with insufficient skills, tend to remain behind for the duration of their educational experience, and are at a higher risk of dropping out than those with a higher socioeconomic status (Arnold & Doctoroff, 2003; Taylor, 2005). The challenge lies not only in the authenticity of the experience, but also in the recognition that poor educational attainment is a major cause of poverty, and poverty is a key influence on academic failure – so it should not be surprising that

poverty tends to be chronic, or that poor achievement has massive costs to individuals and to society (Arnold & Doctoroff, 2003).

In a study of elementary and secondary school achievement scores, Sutton and Soderstrom (2001) identified several controllable and non-controllable social demographic factors that were found to be significantly correlated with scores on the Illinois Goal Assessment Program (IGAP). Uncontrollable social factors included low income, attendance rate, mobility, and percentage of white students; while controllable social factors included expenditures per pupil, pupil-teacher ratios, teacher salary, and teacher experience.

Multiple regression analysis illustrated that of the controllable social factors, expenditures per pupil was the most significant predictor of achievement at the elementary school level, followed by teacher salary; and teacher salary was the most significant predictor at the secondary school level, followed by expenditures per pupil. Multiple regression analysis further illustrated that of the uncontrollable social factors, low income was the most significant predictor at the elementary school level, followed by the percentage of white students; and attendance was the most significant predictor at the secondary level, followed by low income. In taking a closer look at these findings, six of the eight most significant predictors of achievement are directly related to monetary effects. However, the remaining two, percentage of white students and attendance, could be viewed as in indication of financial ability in that white students overall tend to have higher levels of socioeconomic status than non-whites. Additionally, lower income

students tend to lack appropriate health which leads to increased recovery times and increased absences from school (Sutton & Soderstrom, 2001).

Sutton & Sodestrom (2001) conclude that the obtained R^2 values were low in accounting for the variance in achievement scores across both controllable social factor models (R^2 =.26 and R^2=.18 at the elementary level for reading and mathematics, respectively, and R^2 =.23 and R^2 =.23 at the secondary level for reading and mathematics, respectively). However, the obtained R^2 values were significantly higher in accounting for the variance scores across both uncontrollable social factor models (R^2 =.70 and R^2=.56 at the elementary level for reading scores and mathematics scores, respectively, and R^2 =.74 and R^2 =.62 at the secondary level for reading scores and mathematics scores, respectively). Low income was found to be either the first or second most significant predictor across all models of the multiple regression analysis, confirming that socioeconomic status, and the various demographic properties of the subjects being investigated, cannot be overlooked in research regarding student achievement.

Unfortunately, people tend to blame low academic achievement on laziness or incompetence on behalf of the student while overlooking the systematic causes and effects of poverty (Taylor 2005). However, the systematic causes and effects of poverty are outside of the scope of this paper and research on the subject of Critical Race Theory addresses this phenomena.

What are the long term effects of poverty and low socioeconomic status on student achievement? Why does the cycle of poverty repeat itself over and over again?

What can we do to alleviate these effects such that students have an equal opportunity to succeed? Toutkoushian and Curtis (2005) attempt to answer these questions in their investigation of the relationship between district level socioeconomic status and variations in student test scores, college attendance rates, and high school rankings. In their investigation of 73 public high schools in New Hampshire, three independent variables were investigated: percent of students receiving free lunch, percent of parents with a bachelor's degree or higher, and unemployment rate; across five dependent variables: grade 10 English scores, grade 10 mathematics scores, percent of graduates attending college, percent of graduates attending any postsecondary institution, and percent of graduates taking the scholastic aptitude test.

Toutkoushian and Curtis (2005) used multiple regression analysis on the data mentioned above and found a multitude of significant correlations. For the purposes of this writing, however, this research will address the results for the variables dealing with socioeconomic status. The percentage of adults in the district with bachelor's degrees was found to be significant and negatively correlated with the percentage of students receiving free or reduced price lunch, $r\ (73) = -.69, p < .01$. The percentage of adults in the district with bachelor's degrees was also found to be significant and negatively correlated with the unemployment rate of the school district, $r\ (73) = -.42, p < .01$.

These relationships show that adult education levels affect the cycle of poverty, and that increases in education increases the socioeconomic status of both adults and their children. This is supported by the statistically significant correlation that was found

among the percentage of students in the district who were eligible for free or reduced price lunch (a measurement of socioeconomic status) and all of the five dependent variables: with mean English test scores (+.64, at $p < .01$), mean mathematics scores (+.55 at $p < .01$), average proportion of seniors attending a 4-year college or university immediately after graduation (+.54 at $p < .01$), average proportion seniors who enrolled in any post-secondary institution (+.52 at $p < .01$), and the average proportion students who took the scholastic aptitude test (SAT) (+.61 at $p < .01$).

Additionally, results showed that the three independent variables - unemployment rate, the percentage of students in the district who were eligible for free or reduced lunch, and percentage of adults in the district with at least a bachelor's degree – accounted for 53% of the variance in mean English test scores, 53% of the variance in mean mathematics test scores, 56% of the variance in the average proportion of students attending a 4-year college or university immediately after graduation, and 56% of the variance in the average proportion of students who took the SAT. These data support the conclusion that lower income children illustrate lower levels of academic achievement, are less likely to attend college than their more affluent classmates, are less likely to have college educated parents, and are less likely to apply for college admission.

Toutkoushian and Curtis (2005) concluded that socioeconomic status factors have a strong relationship with the average performance of students in New Hampshire public high schools. For this, they reason that it is unfair to compare low socioeconomic status school districts with high socioeconomic status school districts solely on the basis of

outcomes (academic achievement), and that the effects of socioeconomic status must be removed from district achievement scores in an effort to level the playing field and show more accurately how schools are meeting the needs of the children they serve.

The importance of socioeconomic status and its effect on student achievement transcends national boundaries. In a study of the relationship between resources, inequality, privilege, and academic achievement, Chiu and Khoo (2005) used data from 41 countries (N=193,076) to investigate how resources at country, family, and school levels effected student achievement; how inequities in resource distribution effected this achievement; and whether privileged student bias effects overall achievement.

Chiu and Khoo (2005) found that children of richer countries had a higher level of socioeconomic status, and the parents of these children had higher levels of education, skills, and income, which subsequently enabled them to provide additional educational resources for their children. They also found that the highly educated, high income parents found in these countries more often surrounded themselves with other adults of the same financial status, thereby increasing their children's position of privilege and access to resources. Additionally, these families tended to live in richer neighborhoods whose schools were able to benefit from the same access to resources, income, and privilege, thus being able to provide its students with all the tools they needed to succeed.

In linking the above relationships to student achievement, Chiu and Khiu (2005) found that students with more country resources, family resources, and schoolmate resources scored higher on mathematics, reading, and science scores, and students in

richer countries scored higher in those subjects as well. They also found that parental socioeconomic status effected their children's mathematics, reading and science scores, and that children of lower socioeconomic status received benefits from their higher socioeconomic status classmates' access to additional resources.

The idea of lower socioeconomic status students receiving benefits from their higher socioeconomic status classmates is supported further by the research of Rumberger and Palardy (2005) who, in a study of the relationship between student composition and academic achievement of 14,217 high school students, concluded that the effects of school level socioeconomic status were almost as large, and in some instances much larger, than the effects of individual student socioeconomic status on achievement growth. In their study, achievement was measured by examining the four core subjects that are the foundation of our current educational system: mathematics, science, reading, and history. They found that while a student's individual social class background statistically correlated with their achievement, so did the social class backgrounds, or peer effects, of the students within their school.

Per-pupil Capital Expenditures

The absence of substantial empirical research significantly correlating student academic achievement with the physical environment of the school is resulting in an incremental, piecemeal examination of the phenomenon. Funding inequity, as mentioned earlier in this writing, is the umbrella under which direct relationships between facility

conditions and student achievement can be correlated. It is through this very funding inequity that facility decisions are made that directly effect their condition.

Building condition can be defined subjectively in several different ways and by many different variables. In a study conducted by a team of architects, engineers, and maintenance workers, Berner (1993) evaluated school facility conditions in Washington, D.C., in an effort to find a relationship between building condition and academic achievement. The measurements used to assess condition were the cost of repair and the overall team consensus of the condition of the school – poor, fair, or excellent. Academic achievement was measured according to students' scores on the Comprehensive Test of Basic Skills.

The research found a significant relationship between building condition and student achievement to the extent that an increase in school condition from poor to excellent would predict an increase of 10.9 points in average achievement scores (Berner, 1993). This is a critical finding in support of school districts that attempt to augment their per-pupil expenditures in terms of maintenance and capital improvement budgets. As the condition of the building improves average student achievement scores improve. Berner (1993) found that for every 10 year of increase in building age, its condition will decrease by .50 on a scale of 1 to 3 indicating building condition from excellent to poor.

A 2002 survey of 835 teachers in the District of Columbia using a systematic multivariate study of teacher retention based on the quality of facilities was conducted. Buckley, Schneider, and Shang (2005) found that when several other factors were

controlled for, the quality of school facilities was an important predictor of teacher retention and attrition. Poor indoor air quality, lack of thermal comfort (heating and air conditioning), classroom lighting, amount of natural daylight, and ambient noise level, were the factors related to building condition that have an effect on perceived conditions of comfort.

Likewise, a study of community college students found that space, lighting, furniture, room arrangement, technology, acoustics, climate, and interior ambiance contributed significantly to student focus, attentiveness, perception, and mental attitude towards education (Veltri, Banning, & Davies, 2006). The study discussed ways in which current students should be involved in future renovation or new construction projects by providing feedback on what they perceive to be functional and non-functional learning environments. They felt, "their experience should not be ignored but assertively sought so that the new and renovated classrooms will reflect their 'expertise' and not repeat facility design mistakes of the past" (p. 525).

Capital outlay funding is an important component of maintaining or improving the quality of facilities, or of preventing the deterioration of school facility conditions. Thompson et al. (1989) found that, in comparing the fiscal capacity of rural and urban school districts in the state of Kansas, wealthier districts had better facilities than poorer districts. Plans for improvements were adversely affected by existing wealth, existing debt, age, and condition of facilities. It is prudent to note here that the condition of the

facility was found to obstruct access to the very funding that would be necessary to improve it.

In reviewing several statewide court cases involving infrastructure funding and its relationship to achievement Crampton, Thompson and Vesely (2004) conducted case studies of six prominent legal battles often cited in related research. A brief summary of the results are as follows.

In West Virginia the court resolved that schools must provide adequate space, itemized specific details for facility appropriateness, and concluded that the concept of infrastructure as a vital element of educational opportunity was legitimate (*Pauley v. Kelly,* 1979).

In New Jersey (*Abbott v. Burke,* 1985, 2011) the court concluded that the state must ensure delivery of the constitutionally mandated educational programs in the best interests of equality for all children. In an attempt to overhaul mainstream thinking on the subject, the state was required to fund all costs necessary for facility remediation and construction in identified disparate districts, to fund the costs of temporary facilities during the process, and to implement managerial responsibility over school construction.

A school financing and infrastructure case was brought in Arizona and was the first case brought to any state that specifically sought litigation for infrastructure inequity (*Roosevelt Elementary School District v. Bishop*, 1994). The court determined that funding schemes that resulted in gross disparities in district funding were not uniform and ultimately invalidated the entire state's school funding system. Although total

compliance and implementation of the rulings are to this day being resisted and appealed, the overarching ramifications are significant.

Similar cases have been adjudicated in Texas, Ohio, and Wyoming – all resulting in substantial amounts of funds being redirected towards school infrastructure - which underscores the need for nationwide redress of the formulas used to equalize the playing fields of schools located in poor districts with schools located in wealthy districts. Crampton, Thompson and Vesely (2004) reiterate that the vast disparities in schools districts' property wealth would inevitably result in gross inequities in school funding and infrastructure. Similar to Virginia, property taxes contribute to the pool of monies available for school funding.

Developing countries have conducted similar studies in attempting to link facility conditions to academic achievement. Although at a drastically reduced scale, developing countries are faced with similar achievement shortfalls as a function of facility condition. Mwamwenda and Mwamwenda (1987) found that in Botswana, pupils in schools with sufficient classroom capacity performed significantly better than those in schools without this capacity when evaluating mathematics and social studies. They did not find a significant difference in their performance in English test scores. Not only was there a significant relationship between academic performance and the availability of classrooms, but also between academic performance and the availability of desks, seats, and books.

Although the difficulties faced by foreign nations in providing adequate learning facilities may seem archaic to those living in the United States, Mwamwenda and Mwamwenda's research shows that the best possible pedagogical endeavors must take place in the best possible physical environment – at any level of industrialized wealth.

The current funding model for public schools continues to oppress those in genuine need of an increase in fiscal capacity. As Thompson et al. (1989) point out, "the commonality of local responsibility for funding facilities results in uniquely differing outcomes reflecting the varying effects of tax base sufficiency on physical condition, facility planning, and the need to continually improve educational programs" (1989, p. 30).

To support correlations between academic achievement and per-pupil capital expenditures this study examined various aspects of the physical environment of the school and reviewed the existing research as individual components that, when taken collectively, defined the term physical environment. One of these components was the age of the facility.

McGuffey and Brown (1978) argued that a school building is an educational resource, and as such, should be properly maintained and conserved such that its usefulness is not depleted. Children that attend school in ancient, obsolete, poorly maintained buildings with inadequate lighting, poor ventilation, and lack of space (overcrowded) tend to identify their education as inadequate or obsolete. Using stepwise multiple regression analysis McGuffey and Brown concluded that school building age

had a significant, inverse relationship with reading and mathematics achievement in the 4th grade when socioeconomic status was controlled for, and accounted for slightly less than 3% of the variance in achievement scores. They found conflicting results in the data for fourth and eleventh grade students and suggest that continued research is necessary in this regard. Stating that, "obsolescence and inadequacy of buildings detract from the learning process while a modern, controlled environment enhances learning" (1978, p. 9), the idea that a building's age should be an investigative factor when investigating per-pupil capital expenditures is underscored.

The most recent data on nationwide school construction, although dated, states that over 50% of the school buildings in this country were built before 1960; with only 6% of schools being built since 1980. Additionally, the demand for new school construction in growing neighborhoods forced many school districts to forego the maintenance and renovation of aging schools causing exponential renovation and replacement troubles - resulting in deteriorating, uncomfortable, inadequate learning environments (Honeyman, 1994).

In reviewing these data with the findings of McGuffey and Brown (1978) the future of our nation's continued academic achievement is in danger as 94% of our schools surpass the 20 year mark and become increasingly associated with lower achievement scores. According to Crampton, Thompson & Vesely (2004) building age accounts for a statistically significant 18% of the variation in school building condition.

Per-pupil Instructional Expenditures

The predictor variables in this investigation are all related to per-pupil expenditures. Although capital expenditures are reviewed in this research, examining instructional expenditures in a similar fashion provides a consistent evaluation of the research questions. School budgets contain a wealth of categorical expenditures, however, the main purpose of schooling is to impart knowledge, cultivate skills, and hone the abilities of the students being taught. It was expected that expenditures on instruction would have the most significant correlation with student achievement with respect to all school spending.

In an effort to buttress the conceptual model illustrating a relationship between instructional spending and student achievement, Odden et. al. (2008) provide a model (Figure 1) to define what expenses fall under the instructional category. Revisiting Figure 1, one can conclude that expenditures for teaching and teachers require the most resources in that core teachers comprise the largest portion of school-based expenditures per pupil. In their study of 11 schools across four states Odden, et. al. found that nine of the schools had implemented specific, comprehensive strategies to improve instruction. Because school-level expenditure reports remained an aggregation of broad categorical functions, they sought to uncover the details of how educational dollars were used within the instructional categories and how resource allocation could actually be linked to student performance.

Although Odden et. al. (2008) found that the majority of school-based expenditures were for core teachers, they also found the widest range of school-based spending occurred within the expenditures for this group as well – demanding a range of 32% to 50% of school level expenditures. Not surprisingly, however, they found little differences in actual school based per-pupil spending for core teachers - ranging from $2,012 to $2,745 per pupil. This finding contributes to questions regarding the equitable distribution of school funds and justifies additional research endeavors specifically related to the allocation and reallocation of school resources to provide a more level playing field when educating children of varying social and economic backgrounds.

In a study of educational funding practices of the Illinois State Board of Education, Wall (2006) examined the relationships between educational achievement and funding; school composition, educational achievement, and funding; and school environment, school composition, educational achievement, and funding. Wall felt that maximizing school achievement at their existing resource levels was an admirable goal shared by educational administrators, school boards, and citizens alike. Using descriptive statistics to examine the relationships stated above, and analyzing the patterns of the top and bottom quintiles, results showed that the top 20% of districts, with respect to achievement on standardized test scores, consistently had more per-pupil state and local revenue, spent more money per student on instruction, and showed higher assessed property values per student. This finding supports references quoted in this paper that

found links between per-pupil spending and socioeconomic status, yet it introduces instructional expenditures per student as a possible variable.

With respect to the relationship between school composition, educational achievement, and funding, Wall (2006) found that the top 20% of districts, with respect to achievement on standardized test scores, had a higher percentage of teachers with Master's degrees, higher teacher salaries, and teachers who are less likely to be minorities. While the first two findings directly support the nexus between instructional expenditures and student achievement, the last finding - that teachers were less likely to be minorities - supports significant research that reveals school district practices in which unqualified, inexperienced, and lesser educated teachers are being staffed at under-achieving schools as an unsanctioned rite of passage before being rewarded with assignments to higher performing schools (Fetler, 1999; Heck, 2007; Laczko-Kerr & Berliner, 2002; Powers, 2004; Wall, 2006).

Wall's (2006) last relationship inquiry - school environment, school composition, educational achievement, and funding - found that the top 20% of districts, with respect to achievement on standardized test scores, were less likely to have minorities, less likely to have English as a second language students, less likely to have low income students, and less likely to have student transience. Additionally these schools had the highest levels of parental involvement. The poorest performing schools at the bottom 20%, with higher numbers of low income and minority students that changed schools during the academic year, systematically received less state and local per-pupil funding and spent

less per pupil on instruction. Akin to the findings under the school composition, educational achievement, and funding inequities, the addition of environmental variables supports the findings that teachers in these poor performing schools were less experienced and less likely to hold master's degrees.

The research of Laczko-Kerr and Berliner (2002) underscores the need for fully certified teachers in their investigation of a widely popular alternative certification program - Teach for America. Using a sample of 109 matched pairs of Arizona teachers (N=218) from five low-income school districts, they investigated the test scores of students of fully credentialed teachers in grades 2-8 and the test scores of students of teachers with emergency, temporary, and provisional certifications. The latter group was considered under-certified and was the focal point of the study. Because Teach for America teachers are regarded as minimally trained and seldom evaluated, the program, "often place(s) such poorly trained teachers with the most needy students in the nation" (p. 13).

The results of Laczko-Kerr and Berliner's (2002) research showed that for the 1998-1999 school year, students taught by certified teachers outperformed those taught by under-certified teachers in reading, language, and mathematics. Scores in reading and language were significantly higher while the scores in math were not. Furthermore, for the 1999-2000 school year, students taught by certified teachers outperformed those taught by under-certified teachers in reading, language, and mathematics: all differences were found to be significant. This same pattern of results was found when comparing the

scores of students taught specifically by teachers from the Teach for America program with those taught by certified teachers. These results also showed statistically significant differences in test scores for all reading, language, and mathematics tests examined in the study.

A noteworthy caveat of the Laczko-Kerr and Berliner (2002) study is that the already low achieving students experienced about 20% less academic growth than they would have received had they been taught by a regularly certified and credentialed teaching staff. These data show that the brightest and newest teachers from the Teach for America program do not outperform those teachers with any other emergency, temporary, or provisional licensures or certifications.

In continuing to examine the Odden et. al. (2008) model of instructional expenditures, teaching, and therefore teachers, consume the most resources in the district school budget. In a 2007 study of mathematics achievement of kindergarteners using the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K), which followed kindergarteners beginning in the fall of 1998 through high school graduation, Bodovsky and Farkas (2007) investigated mathematical achievement gaps in kindergarten as a function of social class and race. Factor analysis was used to define the dimensions of math instruction, resulting in five dimensions of instructional processes' and eight dimensions of instructional content. Finally, HLM regression was used to predict participation in a full day program to predict the measures of instructional process and content mentioned above, and to predict mathematical achievement.

What Bodovsky and Farkas (2007) found was that a combined traditional and group/interactive instructional approach was associated with increased math performance; that full-day kindergarten programs – which provide more time for instruction - were more likely to use this combined instructional approach; and that full-day kindergarten programs were more likely to be taught by teachers with master's degrees. Tangentially, the increased contact between students and teachers in full day programs is more likely to be found in low SES schools, therefore providing the potential to significantly raise scores of impoverished students and work towards closing the achievement gap in kindergarten mathematics scores. Staffing schools with more experienced teachers, providing more full-day kindergarten programs, and offering various types of curriculum that addresses varying learning styles, all lend credence to the conceptual model shown in Figure 2 by supporting the positive relationship between instructional expenditures and achievement.

In an investigation of California's Public Schools Accountability Act, Powers (2004) examined the tenets of *Williams v. State of California*, which was brought on behalf of public school students in an attempt to force the state to address inequalities in their public education funding system. Powers focused specifically on teachers (credentials, experience, and educational attainment), textbook expenditures, and facilities (utilizing the school calendar as a proxy), and their relationships with school performance as measured by the Academic Performance Index (API). The API is

calculated using the results of state mandated standardized tests administered to all students in grades 2-11, and has been institutionalized in state policy.

While the intricacies of the lawsuit delved into areas beyond the scope of this research inquiry, its fundamental findings, "support the plaintiff's arguments that the basic educational necessities targeted by the case should be the object of state policy in conjunction with accountability practices" (Powers, 2004, p. 763). In her investigation of the Williams case and subsequent analysis of 6,602 students in California district schools using the foci mentioned above, Powers found positive, statistically significant relationships between teachers' years of teaching, teachers' highest level of education, per-pupil expenditures on textbooks, instructional salaries per pupil, and real estate taxes per pupil (a measure of socioeconomic status), and student achievement. Additionally, a negative and statistically significant relationship was found between emergency credentialed teachers, student-teacher ratio, and year-round facility use (which the author yields could be a function of the amount of instructional contact received versus the testing cycle used in the study), and student achievement.

An important finding worth noting is that the coefficients of the regression model for variables measuring teacher credentials are much larger in high school than in elementary and middle school. This may support the conclusion that more specialized training is required for teachers at the high school level versus elementary and intermediate levels in order for them to contribute significantly to student scores.

The Powers (2004) study supports the conceptual model of this study by showing significant relationships between expenditures typically classified as instructional, and student achievement. This study also supports the research model with respect to the effects of socioeconomic status on student achievement by investigating real estate taxes paid per pupil, student transience, English language proficiency, and eligibility for free and reduced price lunch – all of which were found to have significant, negative relationships with student achievement. Powers surmised that school districts that spend more money on instruction are able to hire teachers with more experience, fuller credentials, more certified staff, and are able to lessen the student-teacher ratio. Powers concluded that, "if schools and students are to be judged on the basis of their test scores, they should be given equal access to the school related resources commonly associated with academic success – qualified teachers, sufficient and up-to-date textbooks, and adequate, safe facilities" (p.786).

Although the research model presented in Figure 2 assumes a direct association between per-pupil expenditures and achievement, Jefferson (2005) posits that additional monies have only the potential to improve educational opportunities, however, "the translation of these opportunities to actual student achievement ... relies more on how available dollars are used than the availability of dollars" (p. 122). Jefferson maintains that it may be more important to create an educational environment that respects teachers' interactions with students, and supports teacher growth and development; and that this idea does not necessarily require additional expenditures.

An in-depth investigation of how funds are actually spent at the local level is beyond the scope of this investigation, however, Jefferson's (2005) presumption is ripe for further investigation and may present a limitation to the assumptions presented in the model. This research shows a more causal and statistically significant relationship between per-pupil expenditures and student achievement than the more casual association hypothesized by Jefferson.

A more rigorous study on the relationship between teacher quality - defined as the percentage of teachers who meet state licensing, content, and performance standards - and student academic achievement and growth rates was conducted by Heck (2007). This study was a result of NCLB requirements for teachers to be highly qualified, degreed, and licensed. Focusing on teacher quality and its relationship with student achievement and growth rate levels in reading and math, Heck explored whether the quality of the teaching staff, as an organizational property that varies across schools, is related to observable differences in student achievement and growth. He further explored whether this relationship varies as a function of student social class and racial background.

Using a random sample of 197 Hawaiian elementary schools and over 14,000 fifth grade students, Heck (2007) was able to show that all levels of his analysis were significantly related to academic achievement and growth of the students in the sample. Mean teacher quality was found to be significantly and positively related to both math and reading achievement wherein a 1 standard deviation increase in average teacher

quality would yield a 4-point increase in student reading scores and a 3-point increase in student math scores. Between schools, student composition (as a function of targeted NCLB subgroups: socioeconomic status, English language learners, minority status, and special education status) was negatively related to growth rates in both reading and math – which suggests substantial inequities in the social distribution of learning. Notably, students within targeted NCLB subgroups made more gains as a function of teacher quality than their peers in more average student compositional settings. With respect to analyzed achievement gaps, a 1 standard deviation increase in average teacher quality would result in an approximate 36% reduction in the yearly math, and 19% reduction in the yearly reading gaps of students of low socioeconomic status.

Heck's (2004) research indicates that teacher quality is in-fact related to student outcomes, at least as it relates to reading and math scores of Hawaiian elementary schools. Heck confirms that higher school-level certification, content knowledge, and performance requirements are positively associated with student outcomes, while acknowledging that definitions of "highly qualified" vary from state to state. However, this acknowledgement should not prevent one from concluding that increased expenditures for teacher quality, no matter the definition, constitute increased expenditures for instruction and therefore support the research questions at hand.

Although teachers are the most visible and tangible part of the educational arena, an Illinois study of the cost of an adequate education found that 20% of the top performing schools consistently had more state and local per-pupil revenue, higher

expenditures per-student on instruction, higher assessed property values per-student, and a lower school tax rate per $100 (Wall, 2006). However, "the lack of power to alter demographics does not justify complacency towards the education of disadvantaged students" (Fetler, 1999, p. 10). What Fetler is intimating is that all students, rich and poor, should be given the resources necessary for a quality education. While some would position teacher knowledge, skills, and abilities as the sole contributor to student academic success, Fetler maintains that we must acknowledge the significance of confounding variables.

Per-pupil Expenditures

A wealth of research exists in support of the expectations that school spending increases result in student achievement increases – that if we invest more money into our schools, we will obtain better academic results (Darling-Hammond, 2007a; Harter, 1999; Slavin, 1999; Wenglinsky, 1997; Wenglinsky, 1998).

Studies have been conducted to support the linkage between spending with achievement, spending with early childhood development, and spending with perceived teacher self-efficacy. In order to substantiate the sufficiency of *additional* spending, there should be a common, ground level of spending established as a point of reference. For this reason Reschovsky and Imazeki (2001) developed a statistical approach to quantifying the cost of public education in Wisconsin and Texas by developing foundation formulae in an effort to equalize funding differences within school districts.

Foundation programs establish a minimum level of per-pupil funding that localities must meet with a combination of local and state funding, which, by law, no district can fall below (Owings & Kaplan, 2006, p. 210). Reschovsky and Imazeki's research mimics a majority of studies conducted in this area in that both Texas and Wisconsin will require "substantial infusions" of additional monies to raise student scores to adequate levels. The studies examined in this section will elaborate further.

In a study of Texas Elementary schools Harter (1999) concluded that spending for regular school upkeep, maintenance, and equipment, was positively related to student achievement. Small differences in expenditures between schools districts will account for some variation in student achievement scores. Harter concluded that even when socioeconomic status is controlled for, expenditures for highly qualified teachers and the provision of basic supplies and maintenance are positively associated with higher levels of student achievement.

Successful legal cases have been filed in recent years by low-wealth communities against states that they feel are inadequately and inequitably funding their school districts. However, when cases like these are adjudicated and states begin to fund school districts' requests, questions arise as to the utilization of such funds.

Slavin (1999) investigated this very question of how additional funds can be utilized for the purpose of increasing student achievement. Although not based on empirical data, he concluded that funding programs and practices that are known to be effective, replicable, and familiar to educators will likely have greater payoff to student

achievement than if those programs did not exist. For example, early childhood programs, tutoring programs, comprehensive reading programs, school development programs, and staff development programs all provide an opportunity - though not a guarantee - for improving student achievement. Perhaps further research can be conducted ex post facto to test the associations between the achievement of students in schools that received additional funding over a period of time, and those that did not.

An overarching research study was conducted on 193,076 fifteen-year-olds from 41 different countries to ascertain how resources, distribution inequality, and bias toward privileged students affected academic performance. Chiu and Khoo (2005) found that richer students usually lived in richer neighborhoods and attended public schools with superior physical, teacher, and student resources that are often in better physical condition than public schools in non-affluent areas. They point out that funding per student in one school can be as much as 25 times higher than the funding per student of another as a result of governmental distribution inequality. In their exploration of whether resources at the country, family, and school levels effected student academic performance, and if distribution inequality is a significant factor, Choo and Khoo's research showed that students with more country resources, family resources, and schoolmate resources scored higher on mathematics, reading, and science, and that students in richer countries scored higher overall. The effects of schoolmate resources is especially interesting as one may conclude that integrating high socioeconomic status

students with low socioeconomic status students enables some of the privileges experienced by the richer students to be shared with poorer students.

Chiu and Khoo (2005) also found that parents' socioeconomic status effected student achievement thereby buttressing support for the idea that poverty is cyclical and difficult to overcome. In the absence of additional funding, higher socioeconomic students continue to succeed due to their parents' access to the additional capital necessary to divert more educational resources to their children. Chiu and Khoo's global look at achievement found that when using multilevel regression analyses, students scored higher in all subjects when more resources were available to them in their respective countries.

Motivated by the belief that school-level analysis provides more robust information on per-pupil spending variations by mediating funding idiosyncrasies, Condron and Roscigno (2003) investigated 89 public elementary schools in Columbus, Ohio to investigate such spending variations' effect on student achievement. Achievement in this study was measured as the percentage of fourth graders who passed the state proficiency exams in reading, writing, math, science, and citizenship. Although there was significant achievement variation within schools, they found similarities between the methods local school boards applied in distributing funds and local stratification patterns of race and class. Schools with lower concentrations of minorities exhibited higher levels of pupil socioeconomic status, and exhibited more expenditures

per pupil than did schools with higher concentrations of minorities and lower levels of pupil socioeconomic status.

Other significant spending patterns investigated by Condron and Roscigno (2003) revealed that higher spending levels improved the schools' physical condition, increased attendance, increased the quality of teachers, and increased instructional spending – all of which were found to be significantly correlated with student test scores. The most significant finding in this study suggests that if the lowest-spending schools were locally funded at the level of the highest-spending schools, the percentage of students passing the state proficiency exams could increase between 24% and 40% (Condron & Roscigno).

When examining the intricacies of school district per-pupil spending a myriad of categories are presented into which these expenditures may fall. One such categorical expenditure is technology. Access to technology in the classroom, as well as at home, is critical to the attainment of information, which is essential in advancing education, culture, science, and additional technology (Huang & Russell, 2006). While the term "technology" can mean anything from DVD players in the classroom to internet access at home, for the purpose of this discussion on the digital divide, technology will refer to access to computers and the internet both in school, and at home.

The digital divide describes the gap that exists between students that have access to computers and the internet, and those that do not. Huang and Russell (2006) studied this gap with respect to technology accessibility and its effect on the academic achievement of fifth graders at three Oklahoma City public elementary schools. In a

survey of principals, parents, fifth grade teachers, and fifth grade parents, the authors investigated the ways, means, and extents to which students interacted with, and were exposed to technology for educational purposes.

The data gathered by Huang and Russell (2006) indicated that the digital divide is alive and well in the Oklahoma public school system, and that this divide is affected by student socioeconomic status, computer accessibility at home, internet accessibility at home, and computer accessibility in the classroom. Although no statistical procedures were incorporated to draw these conclusions, the descriptive data presented clearly illustrated that schools with higher student computer access and lower concentrations of poverty performed better on Oklahoma standardized tests with respect to math, science, reading, and writing.

Judge, Puckett, and Bell (2006) found that nationwide computer access and use has improved greatly over the years, however, a digital divide remains in home computer access. Additionally, they found that the ratio of students to instructional computer internet access was higher in schools with the highest poverty concentrations. Although a digital divide was not as pronounced in the classroom one can conclude that simply having computers in the classroom is not akin to having *enough* computers in the classroom. What Judge, Puckett, and Bell did find were significant correlations between computer access at home, frequent use of the internet, computer proficiency, and low school socioeconomic status, and their individual effects on third grade reading and

mathematics scores. This supports the current research investigation of per-pupil spending and its effect on student achievement.

When investigating spending on student academic achievement it is understood that funds are not infinite. School districts have to work within the boundaries of their budgets - sometimes at funding levels far below what they consider to be adequate. What are adequate funding levels? Knoeppel (2007) defines adequacy as the provision of resources sufficient to provide equal opportunities to learn for all students; more specifically, the degree to which the amount of funding provided produces the desired level of student performance with regard to equity in inputs, equity in process, and equity in outputs. This is accomplished by linking resources to student outcomes as it relates to performance on various state assessments. At-risk student populations are most affected by equitable inputs that yield inequitable outputs.

In a study of equity in the Commonwealth of Kentucky, Knoeppel (2007) focused on human resource data to examine the distribution of teachers in the school system. This focus on equity can demonstrate differences in the staffing of high socioeconomic schools and low socioeconomic schools and how these differences affect student achievement. While the focus of equity is on inputs, the focus of adequacy is on outputs. Knoeppel's research is a result of a landmark Kentucky case wherein the entire system of public education was found to be unconstitutional (Rose v. Council for Better Education) because it did not provide the same opportunity to learn across all socioeconomic levels.

In investigating the distribution of teachers in Kentucky, Knoeppel (2007) is working under the premise that teacher effects can account for 55% to 80% of the variance associated with student achievement, thereby having the greatest school-level impact on such achievement. With data from 479 elementary schools, 177 middle schools, and 201 high schools, Title I status was used as in independent variable to determine socioeconomic status of the schools' population. Seven dependent variables – three related to measures of achievement and four related to teacher proficiency were used. Knoeppel found significant differences in teacher proficiency at schools with higher versus lower socioeconomic status. Poorer elementary and high schools were found to have significantly less nationally certified teachers, less experienced teachers, and teachers without graduate degrees. No significant differences were found at the middle school level. Additionally, schools with higher poverty levels scored significantly lower at all levels on statewide assessment exams. This problem is exacerbated by the fact that 175 of 176 (99.4%) school districts were classified as poverty districts.

Adequacy is another dimension of inquiry that must be further researched. The Knoeppel (2007) study goes hand-in-hand with previously mentioned studies of within-district spending. It may suffice that a school district is considered adequately funded on the surface; however, if those allocations are inadequately distributed to the schools the problems of adequacy will remain.

The cited literature also includes scholarly works from some who disagree with the general consensus that increased school spending leads to an increase in student

achievement. Ilon and Normore (2006) postulate through their research of 1,734 elementary schools in Florida that class-size and per-pupil expenditures are the least cost-effective means of raising test scores. In their study the researchers used an ex post facto design to gather all data they felt were indicators of public school expenditures. These included: percentage of low-income students; percentage nonwhite; percentage of administrators; percentage of instructional staff; number charter schools; expenditure per student; school size; percentage of teachers with advanced degrees; teacher's average years of experience; average class size; and teachers per aide K-3.

Ilon and Normore (2006) utilized a regression analysis on the data to investigate how much the eleven indicators above contributed to scores on the Florida Comprehensive Assessment Test (FCAT). Table 1 illustrates the results of their statistical analysis. Beta coefficients show that the percentage of low income students and the number of charter schools have the first and second highest influence on test scores than any other measure in the study, respectively. Expenditures per student, the focus of this research endeavor, ranked the lowest in terms of influence on student achievement. However, all variables of the regression analysis involve implementation costs, which raise the amount of expenditures per pupil. Of the variables that involve implementation costs, percentage of teachers with advanced degrees, teacher's average years of experience, and average class size all involve costs that influence per-pupil expenditures.

Table 1.

Regression Results and Variable Means

	Beta Coefficient	t Value
Constant	82.519	41.462
Percentage of low-income students	-36.945	-38.703
Percentage nonwhite	-5.721	-7.574
Percentage of administrators	1.221	7.203
Percentage of instructional staff	0.188	7.962
Charter	-14.523	-16.497
Expenditure per student	-0.002	-31.295
School size	-0.003	-4.317
Percentage of teachers with advanced degrees	0.027	1.959
Teachers' average years of experience 0.274	5.790	
Average class size	-0.451	-8.690
Teachers per aide K-3	6.980	11.560

Ilon and Normore (2006)

Teachers with advanced degrees command higher salaries than those without such endorsements, teachers with more experience earn more money, and shrinking class sizes mean hiring more teachers - all resulting in higher school operating costs. It takes an

increase in expenditures per student to achieve the results required of those variables that affect achievement. Therefore, Ilon and Normore's (2006) conclusion that expenditures per student has the least effect on student achievement requires further scrutiny.

Another peculiar finding in the research of Ilon and Normore (2006) is that the percentage of school administrators has much more effect on student outcomes than the percentage of instructional staff. While the researchers point out this peculiarity they do not offer an explanation for it. This finding may be fodder for additional research dealing with investigations of faculty, staff, and administrative expenditures and their effect on student achievement. However, without instructional staff, how will students acquire the knowledge from which to gauge academic success in the first place? Any such findings may be totally coincidental and perhaps would need to be investigated with a more rigorous statistical model – perhaps at the *alpha* = .001 level for statistical significance.

Although the regression analysis conducted by Ilon and Normore (2006) does not support all expectations of my research, it does support previously cited research that finds socioeconomic status as one of the most significant predictors of student achievement.

With so much research illustrating the effects of spending on student achievement, what can one conclude are acceptable levels of spending for accomplishing acceptable levels of scholastic achievement for all? What is one willing to spend for a certain type of education? Because there is no universally accepted or proposed formula, Wall (2006) attempts to answer these questions in his research of 810 school districts in

the state of Illinois. In his study three relationships were examined: funding and educational achievement; funding, school composition, and educational achievement; and funding, school environment, school composition and educational achievement.

In the first relationship Wall (2006) found that the top 20% of achieving schools consistently have more per-pupil state and local revenue streams, more expenditures for instruction, show higher assessed property values, and have a lower tax rate. In the second relationship, the top 20% of achieving schools have a higher percentage of teachers with master's degrees, higher teacher salaries, and teachers that were less likely to be minorities and more likely to be highly qualified. Interestingly, this relationship also found that larger class sizes did not have a significant impact on student achievement. However, even in the absence of this relationship, increased funding has been shown to provide other assets that contribute significantly to student achievement (Wall, 2006).

Historical Academic Achievement

In an effort to augment the field of empirical knowledge that demonstrates a statistically significant association between student historical academic achievement and its effect on future achievement, it must be accepted that this relationship suffers from the internal validity threats of history and maturation. Any investigation of subjects over a period of time would be subject to these threats irrespective of the findings. Because insufficient empirical research exists that is specifically designed to investigate past

performance as a predictor of future performance, this review examined overall achievement and its effects on future academic success. Fundamentally, the question is, "is past performance a significant indicator of future performance?"

One of the most prevalent obstacles to relying on historical achievement to predict future achievement is transience. Students who frequently change schools often suffer from low academic achievement, and the United States has one of the highest mobility rates of all developed countries (Sanderson, 2004). In 2001 alone over 38 million people (14% of the US population) changed residences, with over 2 million of those leaving the county altogether. In 2009, over 35 million people (12% of the US population) changed residences, with over 2 million of those people leaving the county altogether (U.S. Bureau of the Census, 2010). Significant population migrations of this nature increase student transience and can have a considerable impact on student success.

Sanderson's (2004) investigation of the mobility of students in the Main Street section of Rock Hill, Pennsylvania and its effect on continuity of instruction and achievement, found that stable students reported the highest test scores with a definite (although not significant) relationship between mobility and achievement – the more moves a student experiences, the lower their academic achievement.

One method of investigating the effects of past performance on future performance is to examine drop-out rates and reasons for same. Battin-Pearson, Newcomb, Abbott, et al. (2000) examined five theories to predict tendencies to drop out of school before the 10th grade - citing this as the critical grade in which most dropouts

exit the school system. The five theories were: general deviance (deviant behavior or sexual involvement), deviant affiliation (relationships with antisocial peers), poor family socialization (low parental expectations and parental educational attainment), structural strains (gender, ethnicity, socioeconomic status), and full academic mediation (the extent to which prior academic achievement acts as a covariate with the previous four theories).

The results of Battin-Pearson, Newcomb, Abbott, et al. (2000) research indicated that under all theoretical models tested, poor academic achievement was the strongest predictor of high school dropouts prior to the 10^{th} grade. Additionally, when each of the variables were considered separately, general deviance, bonding to antisocial peers, and low socioeconomic status had a direct and positive relationship with dropping out of school regardless of historical academic achievement. This supports the earlier assumption that threats to internal validity due to history and maturation are inherent to the design. However, path analyses confirmed that when prior academic achievement is entered into the model, it becomes the strongest predictor of dropping out (standardized path coefficient of .37, $p < .001$).

In a more in-depth study of predicting high school dropout rates Jimerson, Egeland, Sroufe, & Carlson (2000) conducted a longitudinal study of 177 subjects from age 6 months to 19 year that were borne to at-risk mothers. Their at-risk status was determined as function of their age, their education level, and their single parenthood status at the time of childbirth. The design investigated the relationships between the independent variables; early home environment, quality of early care giving,

socioeconomic status, IQ, behavior problems, academic achievement, peer relations, and parent involvement, with the dependent variable; child's high school status at age 19. The dependent variable was grouped into three categories: dropout, traditional, or alternative program. Students matriculating through an alternative program were omitted from the study and others were lost due to attrition, resulting in a sample size N of 143.

Jimerson, et al. (2000) explored multiple predictors of dropping out of school across four developmental measures, divided into four logistic regression models: problem behaviors through age 16, peer competence through age 16, academic achievement through age 16, and parent involvement through sixth grade. In looking at the third logistic regression model, academic achievement, the results illustrated that that the child's gender, early home environment composite, quality of early care giving composite, IQ, socioeconomic status, and academic achievement at grade 6 were each significantly associated with high school status at age 19, achieving a correct classification percentage of 77%.

Academic achievement in first grade and academic achievement at age 16 did not contribute significantly to dropping out of school. An overall correct classification rate of 77% was also achieved by step 3, when only the child's gender, early home environment composite, and quality of early care giving composite was entered into the model. This finding may help me answer the question posed earlier in this section; "is past performance the best indicator of future performance?" According to the research of Jimerson et al. (2000) one might conclude that past performance may not be as

significant as the quality of the home environment and the quality of early care-giving in predicting high school drop outs.

However, in reviewing the correlation coefficients presented in the model, 75.6% of the variance in academic achievement by age 16 was attributable to academic achievement in grade 6 when looking at those variables; and 41% of the variance in academic achievement by age 16 was attributable to academic achievement in grade 1 when looking at those variables. Although academic achievement may not directly predict high school drop outs, it can predict future academic achievement.

Jimerson et al. (2000) found that socioeconomic status was found to be a significant predictor of dropping out across all four logistic regression models. This would prove valuable in research investigating the relationship between socioeconomic status and student achievement, as discussed earlier in this section.

Garavalia and Gredler (2002) approached the significance of prior achievement by looking at its effect on student achievement in college when self-regulation or self-direction of learning is introduced into the model. Although investigating college level achievement is beyond the conceptual scope of this writing, the successful preparation for college as a function of primary and secondary public schooling provides tangential support for investigating historical academic achievement as proposed in the conceptual model.

In their multiple regression analysis of 256 students in 14 undergraduate psychology classes at a southern university, Garavalia and Gredler (2002) found that of

the five self-directed variables (general organization and planning, environmental restructuring, task preparation strategies, recall ability, and study strategies), and the two achievement variables (SAT score, grade point average), grade point average correlated highest with course achievement, followed by general organization and planning, and SAT score. Grade point average appears to be inherently indicative of achievement – low achievers have a lower overall grade point average while high achievers have a higher overall grade point average.

The finding that SAT scores correlate with achievement less than at least one self-directed factor, and less than grade point average, may support the ongoing debate on whether standardized tests are a valid measurement of student achievement and predicted ability. In any investigation of historical achievement and factors contributing to the same, one should take for granted that grade point average will be a significant predictor. However, it is the examination of ancillary factors that will lead to more robust conclusions about ways in which student achievement can be improved. The ancillary factors included in this dissertation are per-pupil expenditures, per-pupil capital expenditures, and socioeconomic status.

Summary of Literature Review

NCLB established a system of educational accountability encompassing all professionals in the field. Teachers, principals, superintendents, schools boards, and state departments of education are all responsible for student success, and are held accountable

for their failures. As cited in this research endeavor, however, many states have been faced with obstacles in complying with this initiative due to inadequate or absent funding.

As discussed in the literature review, funding is the key to academic achievement – adequate funding allows the employment of more experienced teachers, more qualified teachers, increased access to technology, updated textbooks, remedial programs, better learning facilities, enhanced instruction, and access to a plethora of appurtenances conducive to enhanced learning. Although some may argue there is no significant relationship between the two, this research suggests that access to money increases access to those resources necessary to enhance the overall pedagogical experience. Increasing access to funds, thereby increasing access to those additional resources funding can provide, has been shown by the numerous studies cited in this prospectus to increase student achievement.

This review was divided into socioeconomic status and its effect on student achievement, per-pupil capital expenditures, per-pupil instructional expenditures, overall per-pupil expenditures, and the effects of historical academic achievement on future achievement. There is a significant amount of overlap in the findings of the various research studies and learned journal articles cited in the review which led me to want to explore these relationships specifically. While the limitations are vast - as with any inquiry that involves social, economic, and political phenomena - statistically significant correlations, findings, and conclusions can still be generalized to greater populations.

The coming chapters will examine actual Commonwealth of Virginia expenditures and student achievement data to statistically show a nexus between per-pupil spending and academic achievement, with respect to the juxtapositional relationship between funding and the availability of academic resources.

Tangential to this endeavor is support for opponents of the underfunded and sometimes unfunded mandates of the No Child Left Behind Act of 2001. The financial burden this act places on low achieving schools should not be ignored. One can refer those who discredit the impacts of spending on student academic achievement as a contributing factor to the successes or failures of America's school districts to Jonathan Kozol's memorable statement; "If money is inadequate to improve education, the residents of poor districts should at least have an equal opportunity to be disappointed by its failure" (1992, p. 169).

It has been cited in this study that increased spending on education is associated with increases in student achievement. Several research studies have attempted to statistically support this claim while others have attempted to statistically oppose it. The problem lies in the interaction between per-pupil spending and academic achievement, with respect to the juxtapositional relationship between funding and its influence on the availability of academic resources. It can consequently be concluded, therefore, that longitudinal patterns of per-pupil expenditures as a result of longitudinal funding patterns have a direct and significant relationship with longitudinal patterns of academic achievement. It should therefore follow that insufficient patterns of per-pupil

expenditures, as a result of insufficient longitudinal funding patterns, can be associated with insufficient patterns of student academic achievement.

Chapter 3 will describe the subjects, define and explain the measures for all predictor and criterion variables, and summarize the methodology used.

CHAPTER 3: METHODOLOGY

Introduction

Using the definitions that follow in this chapter, the purpose of this research endeavor is to examine the relationships between longitudinal patterns of district level expenditures per-student and their effects on longitudinal patterns of district level student academic achievement in the Commonwealth of Virginia. This research proposes to augment the field of empirical knowledge that demonstrates a statistically significant relationship between student spending and student achievement. By disaggregating per-pupil spending into instructional and capital expenditures, classifying them in terms of district wide socioeconomic status, and studying the longitudinal effects on student achievement, this study will accomplish this task.

Subjects

The subjects that were studied in this research consisted of all 132 school divisions in the Commonwealth of Virginia. Subjects were stratified along average expenditure patterns via methods defined later in this chapter, and included all school districts for the ten year period of the study beginning 2001 and ending 2010.

Measures

Per-pupil Instructional Expenditures

Per-pupil instructional expenditures were computed by obtaining data from each school district's budget for the ten-year period beginning 2001 and ending 2010, in correspondence with the research design. Each district's yearly budget allocated for instruction was divided by the yearly district wide fall membership count for each year of the study, resulting in per-pupil instructional expenditures for that year. This was repeated for all Commonwealth of Virginia school divisions each year from fall 2001 to fall 2010, and provided the longitudinal data necessary for this measurement.

Per-pupil Capital Expenditures

Per-pupil capital expenditures were computed by obtaining data from each school district's budget for the ten-year period beginning 2001 and ending 2010, in correspondence with the research design. Each district's yearly capital budget was divided by the yearly district wide fall membership count, resulting in per-pupil capital expenditures for that year. This was repeated for all Commonwealth of Virginia school divisions each year from fall 2001 to fall 2010, and provided the longitudinal data necessary for this measurement.

Because most capital improvement plans are projected over a 5-year period, the internal validity of the predictor variable, per-pupil expenditures, will be increased if sufficient longitudinal data are included to capture an entire capital budgeting cycle. This

will allow for more equitable comparisons to be made across districts that may not be in the same cycle of their capital improvement programs. The ten-year range of data being examined in this research augmented the validity of the study by substantially increasing the chances that a complete capital budgeting cycle is captured in the data collected.

High Expenditure and Low Expenditure Districts

School division expenditure status is a function of actual district wide per-pupil expenditures for instruction and capital improvements. This was determined by first computing the ten-year mean of instructional and capital expenditures for each school division from 2001 thru 2010. Those divisions that spent less than the ten-year mean for instruction and capital expenditures across school districts were classified as low expenditure school divisions, while those divisions that spent more than the mean were classified as high expenditure school divisions.

The 2001 baseline expenditure amounts for capital and instructional expenditures for each school division were also determined. The difference between this baseline figure and the school divisions' total amount of instructional and capital expenditures in 2010 was computed to establish an "expenditure gain" figure that was used to further categorized socioeconomic divisions along low or high expenditure gains relative to the mean expenditure gains of all school divisions.

These methods resulted in school divisions being classified into one of four possible groups:

- Low average expenditures with low expenditure gains over time,
- Low average expenditures with high expenditure gains over time,
- High average expenditures with low expenditure gains over time, or
- High average expenditures with high expenditure gains over time.

Student Achievement

A performance index was created from the following five variables selected as indicators of student achievement available at the district level.

- Third grade SOL scores in mathematics for the ten-year period beginning 2001, and ending 2010,
- Third grade SOL scores in reading for the ten-year period beginning 2001, and ending 2010,
- Eighth grade SOL scores in mathematics for the ten-year period beginning 2001, and ending 2010,
- Eighth grade SOL scores in reading for the ten-year period beginning 2001, and ending 2010, and
- High school graduation rates for the ten-year period beginning 2001, and ending 2010.

The raw scores of the five variables above were standardized over the ten-year period of study to create Z-scores for each variable, for each school division. These

scores were summed and divided by 5 to create a single yearly longitudinal performance index value for each school division, for each year of the study. The performance index was used as the criterion variable in a repeated measures analysis of variance.

It is acknowledged that certain limitations exist when examining longitudinal treatment effects on dissimilar populations over an extended period of time. For example, the population examined in 2001 may not be the same population examined in the following nine years of the study. However, examining grouped data at the district level will allow general observations and conclusions to be made about the overall performance of Virginia school districts from which additional school level research designs may be developed for further analysis.

Data Collection

As a quantitative study, the research methodology implemented in this study employs statistical procedures to investigate ex post facto data with assumed legitimacy and face validity. All data were collected from current and archived records obtained directly from the Virginia Department of Education.

Division wide expenditure data were collected from the Superintendent's Annual Report - Table 13: Disbursements by Division, for each respective year of the study. Division wide instructional expenditures were taken from raw instruction data while capital expenditures were taken from a combination of raw operations and maintenance services data and raw facilities data.

Division wide SOL pass rates for third grade reading, eighth grade reading, third grade math, and eighth grade math were collected from the Virginia Department of Education's Assessment Results and include Standards of Learning pass rates and other assessments approved by the Board of Education to measure student learning and achievement in English, mathematics, history and science.

Graduation rates were collected from the Report of High Scholl Graduates and Completes and uses the percentage of graduates based on fall membership in the 9th grade, four years prior to the year being reported. This rate includes all diploma graduates and non-diploma completers (i.e. GED recipients).

Data Analysis and Procedure

The sample population being examined in this research were all school districts in the Commonwealth of Virginia. A significant amount of data were collected in support of the research questions for the 132 school divisions as follows:

- Instruction expenditures 2001 - 2010,
- Capital Expenditures 2001 - 2010,
- Average daily membership 2001 - 2010,
- Grade 3 reading scores 2001 - 2010,
- Grade 3 math scores 2001 - 2010,
- Grade 8 reading scores 2001 - 2010,
- Grade 8 math scores 2001 - 2010, and

- Graduation rates 2001 - 2010.

In an effort to examine the research questions and expectations based on the measures identified earlier in this chapter and the data collected above, the following procedures were executed once all data were collected:

Step 1 - Yearly per-pupil instructional and per-pupil capital expenditures for each division using raw expenditure data and division wide average daily membership (ADM) counts were computed.

Step 2 - All student achievement scores were transformed into standardized Z-scores which were used to create the performance index as described in the measures section of this chapter. This yielded one score per school division for each year 2001 - 2010. By using Z-scores it was possible to produce a performance index that utilized equally weighted variables that did not alter the meaning of the performance index year to year. The performance index serves as the criterion variable of the study.

Step 3 - In an effort to group school divisions into like-expenditure categories for longitudinal analysis, school divisions were classified into one of four expenditure categories as described in the measures section of this chapter. Using raw expenditure data the classifications were are as

follows: Low average expenditures with low expenditure gains over the ten-year period of the study; Low average expenditures with high expenditure gains over the ten-year period of the study; High average expenditures with low expenditure gains over the ten-year period of the study; and High average expenditures with high expenditure gains over the ten-year period of the study.

The research questions stipulated previously in Chapter 1 investigate associations between districts divided along lines of average expenditures and grouped into like expenditure categories, and how longitudinal patterns of per-pupil expenditures effect longitudinal patterns of district-wide student achievement. Restated, they are as follows.

1. Are increases in longitudinal patterns of per-pupil instructional expenditures associated with increases in longitudinal patterns of student achievement?
2. Are increases in longitudinal patterns of per-pupil capital expenditures associated with increases in longitudinal patterns of student achievement?
3. Are combined increases in longitudinal patterns of per-pupil instructional and per-pupil capital expenditures associated with longitudinal patterns of student achievement?
4. How do the effects of longitudinal patterns of student achievement differ as a function of longitudinal expenditure patterns?
5. Can past student academic performance be used to predict future student academic performance?

In summary, the predictor variables were the school division capital and instructional expenditures grouped into longitudinal expenditure patterns as discussed in steps 1 and 3 above, and previously in the measures section of this chapter. The criterion variable was the performance index created by converting all achievement scores into standardized scores as described in Step 2 above, and previously in the measures section of this chapter. A repeated measures analysis of variance was run on the predictor and criterion variables as the statistical method of inquiry.

CHAPTER 4: RESULTS

The purpose of this research was to examine the relationships between longitudinal patterns of district level expenditures per-student and their effects on longitudinal patterns of district level student academic achievement in the Commonwealth of Virginia. This research augments the field of empirical knowledge that demonstrates a statistically significant relationship between student spending and student achievement.

The research expectation was that in districts divided along lines of average expenditure patterns, longitudinal patterns of district wide per-pupil expenditures are positively associated with longitudinal patterns of district-wide student achievement; and that past performance can be used to predict future performance. It was also expected that high average expenditure districts would outperform low average expenditure districts with respect to longitudinal patterns of achievement.

In support of the research questions a repeated measures analysis of variance was used to investigate the interactions between the predictor variables, per-pupil instructional expenditures and per-pupil capital expenditures, and the criterion variable, performance index. Pearson correlations were employed to examine the relationship between past performance and future performance. In support of the first part of the research expectations the following three relationships were examined:

- Mean instructional expenditures X mean baseline instructional expenditures X

performance index,

- Mean capital expenditures X mean baseline capital expenditures X performance index, and
- All expenditures combined X performance index.

SPSS was the statistical package used to examine the data and provided the required outputs. Three repeated measures analyses of variance were run in conformance with the three relationships itemized above. The sample population being studied consists of all 132 schools districts in Virginia, however, data screening identified 2% (n=3) of the districts as having insufficient data, thus yielding a sample population of 129 (N=129) school districts.

Mean Instructional Expenditures X Mean Baseline Instructional Expenditures X Performance Index

Analysis of this relationship indicated no within-subjects interaction effects (F (9, 1125) = 0.950, p=.48) for Mean Instructional Expenditures x Mean Baseline Instructional Expenditures x Performance Index, and no between-subjects effects (F (1, 125) = 1.509, p = .22). Therefore, there was not a significant difference in the performance index over time relative to differences in instructional expenditures. With respect to expenditure patterns, 84 districts spent less than the mean of school district expenditures and were

therefore classified as low, while 45 districts spent more than the mean of school district expenditures and were therefore classified as high. Of these districts, 77 exhibited low baseline expenditure gains while 52 exhibited high baseline expenditure gains. However, tests of within-subjects contrasts revealed a statistically significant linear component to the interaction of mean baseline instructional expenditures and performance index ($F(1,125) = 4.12, p=.04$.

As shown in Figure 3, high expenditure districts, spending above average dollars on instruction, experienced an overall reduction in longitudinal achievement over the course of the study. However, those districts that exhibited high expenditure gains from 2001 to 2010 observed less of a loss in student achievement than those that spent less during the same time frame. The districts that had above average expenditure gains over the course of the study performed .10 standard deviation units lower at the end of the study, and those that had below average expenditure gains performed .30 standard deviation units lower at the end of the study.

Figure 4 shows low expenditure districts, spending below average dollars on instruction, experienced an overall increase in longitudinal achievement over the course of the study. Low expenditure districts that had above average expenditure gains over the course of the study performed .07 standard deviation units higher at the end of the study, and those that had below average expenditure gains performed .09 standard deviation units higher at the end of the study.

Although not statistically significant, the trend illustrated in Figure 3 and Figure 4 is that below average-expenditure school districts performed better as a function of longitudinal instructional expenditures than school districts that spent more on average.

Mean Capital Expenditures X Mean Baseline Capital Expenditures X Performance Index

Analysis of this relationship indicated a significant within-subjects interaction effect (F (9, 1125) = 1.86, p = .05) for Mean Capital Expenditure x Mean Baseline Capital Expenditure x Performance Index, and no between-subjects effects (F (1, 125) = .02, p = .88). Therefore, there was a significant difference in the performance index over time relative to differences in capital expenditures in 2001 versus 2010. This partially supports the research expectations with respect to longitudinal patterns of per-pupil capital expenditures being associated with longitudinal patterns of student achievement. With respect to expenditure patterns, 79 districts spent less than the mean of school district expenditures and were therefore classified as low, while 50 districts spent more than the mean of school district expenditures and were therefore classified as high. Of these districts, 79 exhibited low baseline expenditure gains while 50 exhibited high baseline expenditure gains.

As shown in Figure 5, high expenditure districts, spending above average dollars on capital projects, experienced a significant crossover effect with respect to baseline expenditure gains. High expenditure districts that had above average expenditure gains

performed .10 standard deviation units higher at the end of the study, and those that had below average expenditure gains over the course of the study performed .09 standard deviation units lower at the end of the study. Similar to high instructional expenditure districts discuss previously, these districts experienced an overall reduction in longitudinal achievement over the course of the study.

Although the overall performance was lower, those districts that exhibited high expenditure gains from 2001 to 2010 observed significant increases in student achievement, and those that exhibited lower expenditures gains observed significantly lower levels of student achievement.

Figure 6 shows low expenditure districts, spending below average dollars on capital projects, experienced dichotomous results. Low expenditure districts that had above average expenditure gains over the course of the study performed .12 standard deviation units lower at the end of the study, and those that had below average expenditure gains performed .10 standard deviation units higher at the end of the study. However, these districts performed better overall at the end of the study.

The statistically significant trends illustrated in Figures 5 and 6 tell us that the school districts with above average capital expenditures and above average capital expenditure gains experienced significant increases in longitudinal achievement. Interestingly, school districts with below average capital expenditures actually performed better when below average capital expenditure gains were realized and worse when above average expenditure gains were reported.

Mean Instructional Expenditures X Mean Baseline Instructional Expenditures X Mean Capital Expenditures X Mean Baseline Capital Expenditures X Performance Index

With all five variables entered into the model, there was a significant within-subjects interaction effect ($F(9, 1017) = 2.86$, $p=.002$) for Mean Instructional Expenditure x Mean Baseline Instructional Expenditure x Mean Baseline Capital Expenditure x Performance Index; and no between-subjects effects ($F(1, 113) = 1.082$, $p = .30$). Therefore, there was a significant difference in the performance index over time relative to differences in instructional expenditures. This partially supports the research expectations with respect to longitudinal patterns of per-pupil expenditures being associated with longitudinal patterns of student achievement.

When all predictor variables are entered into the repeated measures analysis of variance simultaneously, all instructional expenditure variables significantly affected longitudinal patterns of student achievement, while only capital expenditure gains significantly effect longitudinal student achievement. Average capital expenditure levels had no statistically significant effect on the model when all variables were entered into the model simultaneously.

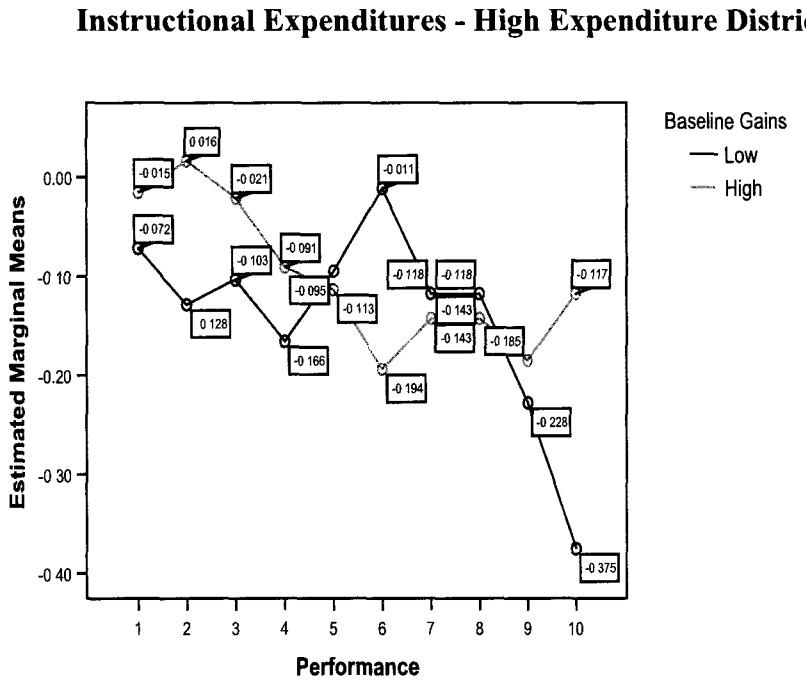

Figure 3. Trends in Longitudinal Performance for High Expenditure Districts with High Versus Low Baseline Expenditure Gains - Instructional Expenditures.

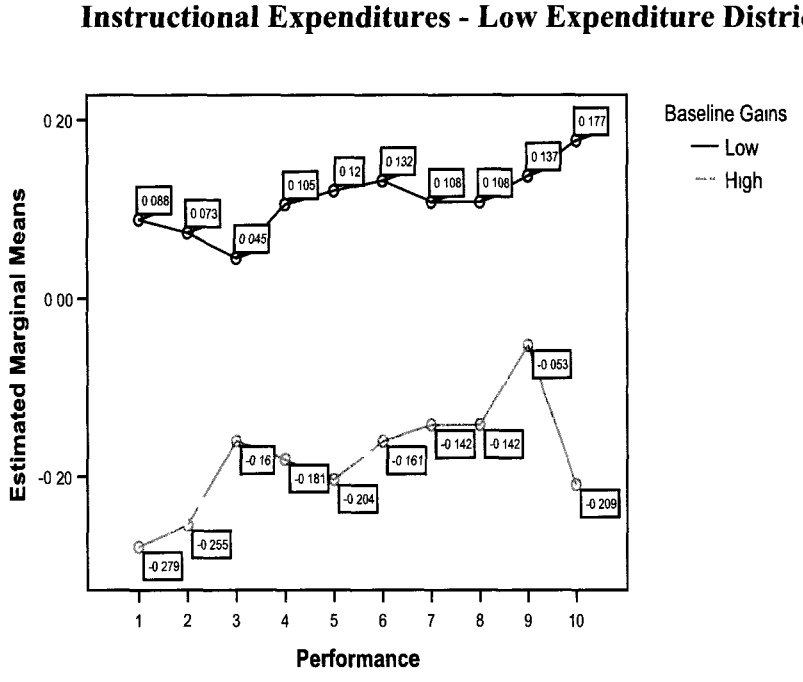

Figure 4. Trends in Longitudinal Performance for Low Expenditure Districts with High Versus Low Baseline Expenditure Gains - Instructional Expenditures.

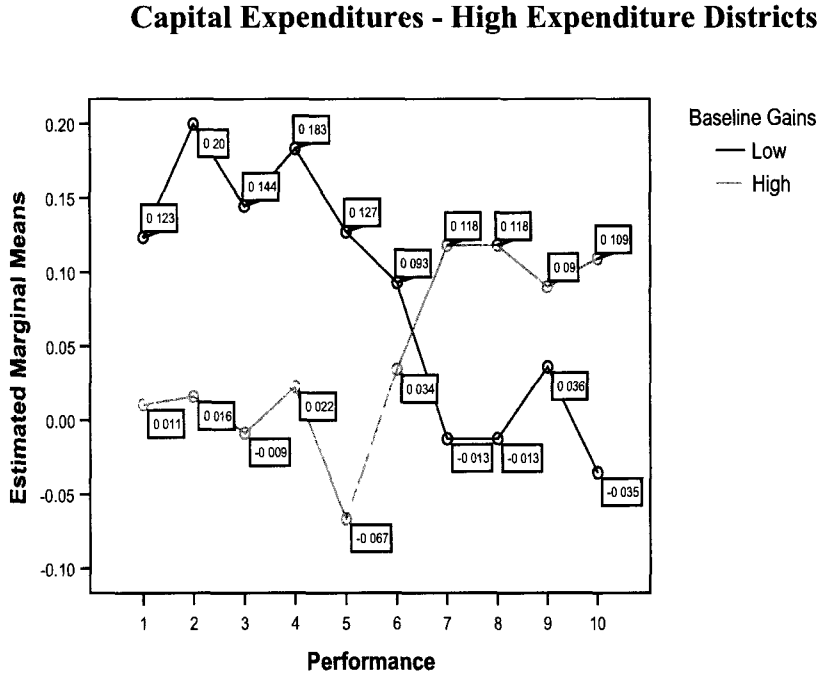

Figure 5. Trends in Longitudinal Performance for High Expenditure Districts with High Versus Low Baseline Expenditure Gains - Capital Expenditures.

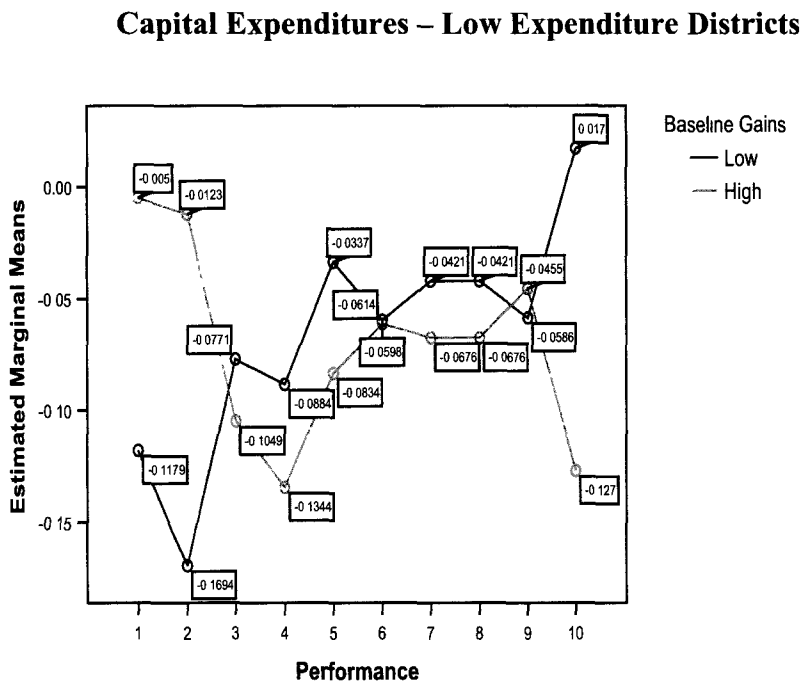

Figure 6. Trends in Longitudinal Performance for Low Expenditure Districts with High Versus Low Baseline Expenditure Gains - Capital Expenditures.

With respect to historical academic achievement trends, 3rd grade SOL scores in reading and math were compared to 8th SOL scores in reading and math five years later; and graduation rates in 2010 were compared to all other years of the study as follows:

- 3rd grade reading and math scores in 2001 versus 8th grade reading and math scores in 2006,
- 3rd grade reading and math scores in 2002 versus 8th grade reading and math scores in 2007,
- 3rd grade reading and math scores in 2003 versus 8th grade reading and math scores in 2008,
- 3rd grade reading and math scores in 2004 versus 8th grade reading and math scores in 2009,
- 3rd grade reading and math scores in 2005 versus 8th grade reading and math scores in 2010, and
- Graduation rate in 2010 and its correlation to the graduation rates of all nine prior years.

An examination of third grade reading scores in years 2001-2005 and eighth grade reading scores in years 2006-2010 for all school divisions revealed a positive and direct correlation between 3rd grade SOL scores and 8th grade SOL scores for all comparisons. This is illustrated in Table 2.

An examination of third grade math scores in years 2001-2005 and eighth grade math scores in years 2006-2010 for all school divisions revealed a positive and direct correlation between 3rd grade SOL scores and 8th grade SOL scores on four of the five comparisons. This is illustrated in Table 3.

An examination of 2010 graduation rates and the graduation rates each year for five years prior revealed a positive and direct correlation between all prior years' graduation rates and the graduation rate in 2010. An analysis using Pearson's correlation coefficients supported this observation, as indicated in Table 4.

Table 2

Correlations Between 3rd Grade and 8th Grade Student Achievement - Reading

	Mean	Standard Deviation	Correlation
Grade 3 Read 2001	60.16	10.70	.594*
Grade 8 Read 2006	76.22	8.89	
Grade 3 Read 2002	68.17	11.08	.566*
Grade 8 Read 2007	78.42	7.90	
Grade 3 Read 2003	68.61	10.49	.554*
Grade 8 Read 2008	81.87	7.21	
Grade 3 Read 2004	68.69	9.62	.546*
Grade 8 Read 2009	85.32	6.77	
Grade 3 Read 2005	74.05	8.80	.172*
Grade 8 Read 2010	87.94	5.70	

Note * N=132, $p < .01$

Table 3

Correlations Between 3rd Grade and 8th Grade Student Achievement - Math

	Mean	Standard Deviation	Correlation
Grade 3 Math 2001	74.40	10.97	.493*
Grade 8 Math 2006	73.22	11.73	
Grade 3 Math 2002	78.19	10.11	.468*
Grade 8 Math 2007	75.63	9.41	
Grade 3 Math 2003	80.05	8.97	.263*
Grade 8 Math 2008	81.26	11.54	
Grade 3 Math 2004	85.17	7.55	.194*
Grade 8 Math 2009	82.69	9.55	
Grade 3 Math 2005	85.52	7.90	.068
Grade 8 Math 2010	83.69	10.09	

Note * N=132, $p < .01$

Table 4

Descriptive Statistics and Correlations: Graduation Rate 2010 with Prior Years

	Means	Standard Deviation	Correlation with 2010
Graduation Rate 2005	72.81	13.24	.650*
Graduation Rate 2006	73.81	12.02	.728*
Graduation Rate 2007	73.72	13.43	.609*
Graduation Rate 2008	76.48	11.10	.583*
Graduation Rate 2009	76.69	11.39	.723*

Note * N=132, $p < .01$

CHAPTER 5: DISCUSSION

The ongoing debate regarding dollars and results with respect to per-pupil expenditures and student academic achievement continues to be argued. The research questions of this study were specifically posited to address education spending and student achievement with respect to longitudinal per-pupil instructional and per-pupil capital expenditures, and student achievement. The research questions were:

1. Are increases in longitudinal patterns of per-pupil instructional expenditures associated with increases in longitudinal patterns of student achievement?
2. Are increases in longitudinal patterns of per-pupil capital expenditures associated with increases in longitudinal patterns of student achievement?
3. Are combined increases in longitudinal patterns of per-pupil instructional and per-pupil capital expenditures associated with longitudinal patterns of student achievement?
4. How do the effects of longitudinal patterns of student achievement differ as a function of longitudinal expenditure patterns?
5. Can past student academic performance be used to predict future student academic performance?

The research expectations for this study were that longitudinal patterns of per-pupil expenditures at the district level would be associated with longitudinal patterns of

student academic achievement according to the performance index, and that in districts divided along lines of expenditure patterns, longitudinal patterns of district wide per-pupil expenditures would be positively associated with longitudinal patterns of district-wide student achievement. Lastly, it was expected that historical academic achievement would be associated with future academic achievement.

In examining how historical academic achievement relates to future achievement, it was expected that past performance would correlate significantly with future performance. This would support the idea that whatever resources it took to reach an achievement goal would have to be maintained if the achievement goal is to be maintained. If this is the case, the circular relationship between funding and achievement discussed previously in this writing will be underscored: NCLB requires achievement in order to obtain funding, however, research supports the conclusion that funding is needed in order to achieve.

The literature review in Chapter 2 presented extensive evidence to support the research expectations and presented investigations of the conceptual model across various schools, cities, states, and countries in an attempt to support the continued equitable and adequate funding of our schools.

Statistical investigation of the research expectations were conducted on each of the disaggregated research questions in an attempt to provide full support for the conceptual model in Figure 2. Conducting a longitudinal study of all school divisions ensures that every student in the model was represented, even though the subjects were

school divisions and not the individual students themselves. The results reported in Chapter 4 can, therefore, be interpreted as fully supporting the research expectations by addressing the research questions.

Research question #1 asked, "Are increases in longitudinal patterns of per-pupil instructional expenditures associated with increases in longitudinal patterns of student achievement?" In reviewing the findings there were no significant within-subjects interaction effects between longitudinal per-pupil instructional expenditures and longitudinal patterns of student achievement. However, Figure 4 illustrates that low expenditure districts performed better overall at the end of the study than at the beginning, regardless of baseline expenditure gains. This could be attributable to the push for student achievement funding under NCLB, which was initiated just two years after the beginning of this study. With all school districts simultaneously initiating extensive testing and accountability programs, with a pointed interest in raising achievement scores, there may be an interaction effect that is reducing the significance of spending on achievement. This begins to support research in the field of inquiry that seeks to statistically support this relationship.

This relationship may be improved if we disaggregate school division instructional expenditures into their respective schools as an attempt to track the money to its final destination. In aggregating data, one loses the ability to track the funding to its end beneficiaries. For example, if a school division chooses to spend more of its instructional dollars on its high schools (with higher teacher salaries, higher text book

costs, lower student-teacher ratios, better technology, etc.), the criterion variable of this model becomes irrelevant, as no high school achievement scores were used in the model. Perhaps graduation rates can be used instead, however, the robustness of raw SOL data versus the dichotomous data found in graduation rates, which is basically a response to a "yes" or "no" question, is reduced. Drilling down and discovering alternative ways to capture these effects would be a good first step in expanding on this research.

In all high expenditure school districts the longitudinal trend was that performance decreased over the course of the study as shown in Figure 3. Although this was not the desired relationship, it is plausible to conclude that wealthy students already have access to better trained and higher paid teachers, classes with lower student-teacher ratios, the latest technology, etc., and that any instructional expenditures would have reached their maximum marginal utility.

In basic terms, the positive effects of instructional expenditures may have already been realized by high expenditure districts, and additional expenditures will not result in additional performance. This follows the economic laws of diminishing marginal utility which put the most utility on the first unit of consumption, decreasing this utility as the units increase. For example, if one wants to decrease travel time to work one might buy a high performance sports car. However, buying a second high performance sports car will not get one to work any faster than when there was only one car. Therefore, the value, or utility, of the second unit has diminished considerably.

It was Chiu and Khoo (2005) who found that students with more country resources, family resources, and schoolmate resources scored higher on mathematics, reading, and science scores. Perhaps these are the covariates that explain why instructional expenses alone may not have a significant effect on the achievement of high expenditure school divisions that already spend above average dollars on instruction and capital projects. Although high expenditure districts performed lower at the end of the study, those districts that had higher baseline expenditure gains between 2001 and 2010 still performed better than those that did not.

Research question #2 asked, "Are increases in longitudinal patterns of per-pupil capital expenditures associated with increases in longitudinal patterns of student achievement?" Chapter 4 reported a significant within-subjects interaction effect between longitudinal per-pupil capital expenditures with respect to baseline expenditure gains and longitudinal patterns of student achievement. In low expenditure districts the divisions with below average increases in capital expenditures over the course of the study actually increased their performance (see Figure 6). This supports the current research question and can be used to illustrate the sensitivity of poorer school districts to increased funding streams.

Contrarily, low average expenditure divisions with above average expenditure gains decreased their performance over the course of the study (see Figure 6). This phenomena could be attributed to recent attempts to achieve equitable funding streams by pumping money into disadvantaged school districts. Without clear direction, planning,

and oversight of how to effectively appropriate these funding streams, the desired outcomes will not be realized. Small, incremental increases in capital expenditures at the lower expenditure districts will allow them time for the due-diligence necessary to plan out their capital cycle and transform the increases into student achievement. Pretentious

It is important to note, however, that below average expenditure school districts performed better overall at the end of the study than at the beginning. We saw this same longitudinal pattern with low expenditure school districts with respect to longitudinal instructional expenditures (see Figure 4).

High expenditure districts exhibited the opposite effect. As shown in Figure 5, these districts, spending above average dollars on capital projects, experienced a significant crossover effect with respect to baseline expenditure gains. These districts, when coupled with above average capital expenditure gains, performed higher than those that did not. What this implies is that wealthy districts must continue to experience capital expenditure gains in order to have a positive effect on student achievement. They must maintain safe, clean, nurturing environments for students, spending above average dollars, and increasing the amount spent year to year to sustain higher levels of achievement.

As illustrated it may not be sufficient to simply stay above the average with respect to capital expenditures, and subsequently "walking away" from these districts will result in lower levels of achievement. Once all of the students become familiar with the

best that money can buy, increases in these expenditures must be maintained once the expectations become the norm and the students begin to take this norm for granted.

In Chapter 2, a 10.9 point increase in average student achievement scores as a function of building condition was reported (Berner, 1993) in concurrence with the current study, which found significance with a similar effect. While Figure 5 shows an increase in achievement of high expenditure school districts that had above average gains throughout the study, Figure 6 shows that low expenditure schools as a whole improved their longitudinal performance over the course of the study. These results must be continuously funded if we are to expect similar results year-to-year. Veltri, Banning, & Davies (2006) found that facility condition contributed significantly to student focus, attentiveness, perception, and mental attitude toward education. Although not an achievement study, it can be inferred that a focused, attentive, and positive mental attitude towards education may contribute to a student's academic success. Additionally, the quality of school facilities was found to be positively correlated with teacher retention (Buckley, Schneider, and Shang, 2005). Retaining effective teachers contributes to student success, therefore, quality school facilities can be linked to student success as well.

The earliest study on capital expenditures and student achievement referenced in this study was conducted by McGuffey and Brown (1978). They argued that the age of the facility significantly impacted student achievement, and that this impact was above and beyond the influences of socioeconomic status. Because older buildings contribute

to higher maintenance costs, repair costs, renovation costs, and replacement costs, increases in capital expenditures continue to contribute to student achievement.

A substantial amount of literature has been written since McGuffey and Brown (1978) to support the correlation between building condition and student achievement. It is worth noting that in 1994, 50% of all school buildings in the country were constructed before 1960, and were therefore over 30 years old (Honeyman, 1994). This fact underscores the need for capital projects to be continually supported to sustain a positive learning environment for children.

Research question #3 asked, "Are increases in longitudinal patterns of per-pupil instructional and per-pupil capital expenditures combined associated with longitudinal patterns of student achievement?" In Chapter 4, when all expenditures were entered into the model simultaneously, a significant interaction effect with all instruction related expenditures, and only baseline expenditure gains with respect to capital expenditures was observed. This supports the research expectations in that longitudinal patterns of instructional and capital expenditures affect longitudinal patterns of student achievement.

Because capital baseline expenditure gains were significant to the model and average capital expenditures were not, the average expenditure patterns of the school divisions with respect to capital expenditures is unimportant, as long as they continually increase the amount of funds spent on them. This is not the case with instructional expenditures, where the average expenditure patterns of the school division is as

important as continually increasing the amount of funds spent on instruction, when all variables were entered into the model simultaneously.

Instructional expenditures are those expenditures that most directly affect student learning. This could explain why both measures of this expenditure type showed up in the interaction effect when all variables were entered into the model. If those factors making learning possible are not funded, there will be no learning.

The research cited in this study would challenge the lack of statistical significance found between average longitudinal capital expenditures and student achievement, impressing upon the need for poorer school districts to have continuous streams of money, however, not finding a statistically significant relationship does not mean there is no relationship. If the division level data used in this research were disaggregated into school level data the expenditures could be followed to the actual schools in which they were utilized, resulting in a strengthening of the links conceptualized in the model.

Overall increases in spending patterns revealed that higher spending levels can improve a school's physical condition, increase attendance, increase teacher quality, and increase instructional spending - all of which were found to correlate significantly with test scores (Condron & Roscigno, 2003). This ties directly into the conceptual model in that capital and instructional expenditures often benefit from general increases in spending.

In Chapter 2 the research of Chiu and Khoo (2005) found that richer students typically lived in richer neighborhoods, attended public schools with resources superior

to those of non-affluent areas, and in some cases enjoyed per-student funding as much as 25 times higher than those in poorer districts. In support of the current research question, the overarching finding in their research is that students with higher country resources, family resources, and schoolmate resources scored higher in mathematics, reading, and science; and students in richer countries scored higher in those subjects as well. These resources enable additional capital and instructional funding and can contribute to the causality of the hypothesized relationships.

In support of instructional expenditures, Knoeppel (2007) found that poorer elementary and high schools had significantly less nationally certified teachers, less experienced teachers, and teachers without graduate degrees. If one looks at technology as a capital expense, the research of Huang and Russell (2006) and the digital divide will underscore the need for increases in these expenditures as well. Descriptive statistics showed that students with access to computers and the internet scored higher on standardized tests with respect to math, science, reading, and writing in Oklahoma City school districts (Huang & Russell, 2006).

Without increases in instruction and capital expenditures, the studies cited above would result in lesser qualified, lesser educated teachers attempting to increase the scores of their low-performing students without the benefit of technology or the experience necessary to overcome the ramifications of not having it. Instructional expenses cover a wide variety of resources required to provide the tools necessary for teaching and learning, while capital expenditures provide the facilities and technology in which to

foster an effective learning environment. As the literature and data suggest, these two expenditure categories may require codependence if they are to maximize their effect on student achievement.

Research question #5 asked, "Can past student achievement be used to predict future student achievement?" A considerable amount of research was cited to support this research question. One of this researcher's professors always said, "The best indicator of future performance is past performance." It was necessary to include this in the conceptual model because many public school funding decisions are based on student achievement. It would follow that any attempts to investigate the effects of per-pupil expenditures on student achieve include historical achievement since this is the variable that provide the funding. This circular relationship contributes to the difficulty of finding a significant relationship with each of the individual predictor variables in this study, rather than needing all predictor variables entered simultaneously for an effect. Wenglisnky (1997) spoke of this circular relationship as discussed in Chapter 2.

Jimerson, et al. (2000) was referenced extensively in chapter 2 in an attempt to link academic performance to school drop-out rates. Although they could not find significance between academic performance and drop-out rates, they did find that by age 16, 75.6% of the variance in academic achievement was attributable achievement in grade 6, and that 41% of the variance in academic achievement was attributable to achievement in grade 1. This corresponds with Tables 2 and 3 which illustrate correlations between 3rd grade reading and math scores, and 8th grade reading and math

scores, five years later. Correlations were significant for all years and both subjects for every pairing except 3rd grade math in 2005 with 8th grade math in 2010. Although Jimerson et al. (2000) could not find significance between academic performance and drop-out rates, Table 4 of this research illustrates that 2010 graduation rates in Virginia are significantly correlated with the graduation rates of the 5 previous years (2005-2009). It follows that if graduation rates are correlated, drop-out rates are correlated as well.

The relationships in Tables 2, 3, and 4 are further supported by Garavalia and Gredler (2002) wherein they found grade point average as the most correlated with course achievement than the other variables they used in the study. Grade point average is a real-time measure of course achievement because it reflects accumulated subject mastery as the student completes classes. It follows that low achievers have a lower grade point average while high achievers have a higher grade point average. Battin-Pearson, Newcomb, Abbott, et al. (2000) also found poor academic achievement to be the strongest predictor of drop outs prior to the 10th grade.

Although it is feasible for student grades to fluctuate year-to-year, the literature cited in Chapter 2 supports the research expectations and the findings of this study in that historical student achievement can be used as a predictor of future achievement.

Table 4 illustrates how graduation rates in 2010 correlate to the graduation rates from years 2005-2009. In all pairings a statistically significant Pearson correlation was found, with the lowest correlation at .65 and the highest at .73. Past student achievement can be used to predict future student achievement as illustrated in the model. Graduation

rates were used as the indicator because this is the culminating activity that oftentimes defines your scholastic achievement. Additional studies can investigate correlations between graduation rates and SOL scores, however, because students cannot be promoted and ultimately graduate without passing these exams, the relationship should be inherent.

Research question #4 asked, "How do the affects of longitudinal patterns of expenditure on student achievement differ as a function of longitudinal expenditure patterns?" Figure 4 and Figure 6 illustrate a trend of increasing academic achievement for low expenditure school divisions with below average expenditure gains across levels of capital and instructional expenditures. This is overwhelmingly supported by the research in Chapter 2. Lower spending on instruction and capital projects was found to be associated with greater achievement gaps nationwide (Wenglinsky, 1997), per-pupil expenditures and teacher salaries were found to be significant predictors of achievement at the elementary and secondary school levels (Sutton and Soderstrom, 2001), while Chiu and Khoo (2005), using data from 41 countries, found that parental socioeconomic status affected children's English, mathematics, and science scores.

An unexpected finding of Chapter 4 is that high average expenditure school districts experienced a longitudinal decrease in achievement across longitudinal patterns of instructional expenditures (Figure 3), while longitudinal patterns of capital expenditures yielded mixed results - decreasing longitudinal patterns of achievement if the gains from the start of the study were below average, and increasing longitudinal patterns of achievement if they were above average (Figure 5). However, it is important

to remember that in both cases, districts with above average instructional and capital expenditure gains between 2001 and 2010 experienced higher student achievement at the end of the study. Therefore, continuing to fund school districts at higher rates will result in increases in longitudinal student achievement.

The literature reviewed in Chapter 2 of this writing supports the findings in Chapter 4. Lower average expenditure school districts continuously benefit from higher spending levels, while higher average expenditure school districts tend to fluctuate in their response to higher spending. Earlier in this chapter it was posited that higher expenditure school divisions were experiencing their maximum marginal utility with respect to longitudinal expenditures on instruction and capital projects, and that spending an extra dollar would therefore not increase student achievement. This does not reduce the need for spending on these school divisions, but emphasizes the need to maintain the very funding levels that resulted in high expenditure district performance. Additionally, it underscores the need to level the playing field with respect to school finance so that all students have an equal opportunity to excel.

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