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# THE TANGIBLE IMPACT OF SCHOOL FINANCE LITIGATION ON STUDENT ACHIEVEMENT

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THE TANGIBLE IMPACT OF SCHOOL FINANCE LITIGATION ON STUDENT ACHIEVEMENT

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY STUDIES

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Table of Contents

List of Tables

Abstract

The purpose of this study was to address the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. The study extended theory established in prior studies and took into account the idea that change takes several years to realize. Another consideration was that sufficient time to fully implement the court's decision and to embark on a mission of reform may not have been possible with the two-year turnaround time provided for in past studies. Six research questions guided the study:

1. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

2. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had a plaintiff victory in an adequacy lawsuit?

3. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

4. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the

fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?

5. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

6. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?

Longitudinal NAEP data was examined to answer the research questions and to contribute to current theory that deals with adequacy, school finance litigation, and student achievement.

Chapter I

## Introduction

The challenges of addressing equity and adequacy in education and closing the achievement gap in the United States have existed for years. The ongoing quest for enhancing quality and providing educational access for all students has been the catalyst for many laws and policies, many of which can be traced back to a common source. "The roots of school finance can be found within a broader history of educational reform and the proceedings of *Brown v. Topeka Board of Education* (1954)" (Reyes & Rodriguez, 2004, p. 4). This case abolished separate-but-equal schools and served as a foundation for the quest to seek equal treatment for all students. Nearly ten years later, the Elementary and Secondary Education Act was passed in the United States, and the federal government began to intervene in an attempt to address the negative impact of compounding social factors and a history of segregation on the academic achievement of students from low-income communities and students of different racial groups (Reyes & Rodriguez, 2004). Reverberating effects from the *Brown* decision have led to many other court cases, laws, and policy changes over the last several decades.

Education officials and policy makers in many states have argued that the funding from federal legislation is insufficient to cover the costs of implementing the new legislation that has stemmed from the Elementary and Secondary Education Act. In more recent years, an example of such legislation is *No Child Left Behind* (NCLB), which requires annual testing of students in third through eighth grade and testing at least once in tenth through twelfth grades. States must also set performance goals, and schools are required to make annual progress in reaching those goals. If schools fail to

meet their adequate yearly progress (AYP) goals, they will face sanctions. In addition, NCLB mandates that all students in each subgroup will perform at a proficient level on the state assessment by 2014.

While federal dollars provide some relief to school districts, states must bear the primary responsibility of financing education in a manner that provides equitable distribution of resources. The cost of providing public education has long been a topic of concern for states, as the need for resources exceeds the funds available. In Pennsylvania, data from 2003-04 reflect some of the discrepancies in financial resources available. The state's highest-spending district spent just under $15,000 more than the state's lowest-spending district, constituting a $375,000 per classroom annual spending gap (Martin, 2006). Similar trends exist across the country, and achievement gaps persist.

States have grappled with feasible options that provide for quality education in all districts. "School finance equalization has probably affected American schools more than any other reform of the last 30 years" (Hoxby, 2001, p. 1189). As a solution to the ongoing quandary of balancing resources and need, some states have introduced such equalization plans in an effort to promote equity in terms of available resources to all districts. Efforts to utilize such equalization measures have resulted in ongoing litigation, and many states have been forced to examine school finance policies in light of decisions made by the courts.

Legal actions play a role in reform efforts aimed at narrowing the achievement gap. According to Glenn (2009), "Numerous individuals and groups are working to eliminate two of the greatest injustices in American public education--the inequitable

and inadequate distribution of educational resources and the persistent achievement gaps between various categories of students" (p. 247). Wenglinsky (1998) defined equity as "a situation in which students' educational outcomes are affected as little as possible by their socioeconomic status" (p. 269).

In response to the inequalities inherent in school funding systems, the finance equalization movement surfaced in the late 1960s (Wenglinsky, 1998). Because the majority of education was financed through local property taxes, much of the available funds depended on the level of wealth in the school district, which in turn, depended on the relative affluence or poverty of the residents in the district, as well as on the value of commercial property (Wenglinsky). "When the perceived poor quality of a school district helps depress its property values, its board needs to increase millage rates just to maintain flat revenue" (Martin, 2006, p. 819). The impact on districts can be lasting. Martin (2006) further explained, "For districts caught in the cycle of low performance, low property values, and high property taxes, it is hard to gain traction on any front" (p. 819). As a result, the students in a district with more wealth could, in theory, receive a higher quality education, while students of lower socioeconomic status might have fewer educational opportunities, based on the availability of resources in the district.

An examination of the concept of adequacy is equally important. Hanushek (1994) provided several possible descriptions of adequacy. At a basic level, adequacy addresses a minimal set of resource needs. More complicated accounts of adequacy begin with a notion of outcome goals and then define resources needed to work toward those outcome goals (Hanushek, 1994). Hanushek further rationalized that, based on these accounts, it is possible to have an equitable system that is inadequate because the

overall resources may be insufficient to meet some desired outcomes. Most schools meet the minimum requirements set forth in areas that may include safety, curriculum, transportation, and facilities. However, "It is the very broad midrange of schools where the majority of spending goes and where there are no obvious defects that is important" (p. 466).

A compounding issue is that it is difficult to tie funding directly with student performance. For example, it is not easy to assign a price to an adequate teacher versus a high quality teacher or to assign a cost with a continuum of services offered, ranging from just above minimal expectations to superior. As a result, tracking spending directly to individual students and certain performance outcomes presents a great challenge. Adding another dimension to this already complex puzzle, Reyes and Rodriguez (2004) asserted that adequacy refers to how educational inputs along the focus of school finance litigation can be tied directly to specific academic outcome expectations. Glenn (2006) described adequacy in terms of giving schools the resources needed to educate each student up to an objective standard. Thro (1994) differentiated between equity, which focuses more on equal protection, and adequacy, which is distinguished by quality rather than equality of education and relies on education clauses in state constitutions. Conley and Picus (2003) asserted, "Adequacy can be considered to be a level of resources sufficient to achieve defined, absolute educational results" (p. 587).

Connections between the constructs of equity and adequacy and academic outcomes are not necessarily palpable, especially when compounded with ongoing social injustices. In the decade following the *Brown v. Board* cases, school finance

cases surfaced. Glenn (2006) noted, "Lawyers shifted toward school finance litigation due to the slow pace of the implementation of desegregation orders and to address directly one of the root causes of educational inequities: resource disparities between different schools" (p. 66). The premise behind the cases was that resource disparities caused gaps in student achievement. Legal experts based their claims on the assumption that making resource distribution more equitable would narrow the achievement gap (Glenn, 2006). While school finance litigation is primarily concerned with economic rather than racial differences, some connections can be drawn between school finance litigation and race as school finance cases address property wealth in the form of property taxes used to finance schools. "Property wealth correlates with personal wealth, but not perfectly by any means. The relation between wealth and race, therefore, occurs one more step away from the disparities in property wealth that make up the primary emphasis of school finance litigation" (Glenn, 2006, p. 66).

Whereas the desegregation cases were primarily a federal matter, school finance equity cases originally came to pass at both the federal and state levels. The first school finance cases were presented on equity of resource distribution grounds and attempted to sever the link between property wealth and school funding through the equalization of per pupil funding across school districts within a state (Glenn, 2006). Such theory was presented in the landmark case, *San Antonio Independent School District v. Rodriguez* (1973). Arguably, the roots of the modern-day issues surrounding school finance can be traced to this case. The 1973 U.S. Supreme Court decision declared that severe financing inequalities among school districts in Texas did not violate the equal protection clause of the fourth Amendment (*San Antonio Independent School District v.*

*Rodriguez,* 1973). Property tax issues and educational finance issues had historically been reserved for local decision-making. This trend was expressed in the Court's decision as part of the rationale for its unwillingness to intrude on local educational policies (*San Antonio Independent School District v. Rodriguez,* 1973).

This precedent is especially important. Prior to this decision, in the state of California, the California Supreme Court became the first state court to strike down a school funding system on equal protection grounds. In this 1971 case, *Serrano v. Priest*, the court held that the state's funding system could not be a function of local property wealth and instructed the legislature to revise the system to ensure fiscal neutrality in that resource distribution would not be tied to property wealth. "The court found both federal and state equal protection violations, but after the U.S. Supreme Court rejected the federal grounds in *Rodriguez*, the California Supreme Court issued another ruling in which it reached the same conclusion based solely on state equal protection mandates" (McCarthy, 1994, p.90). Specifically, the California Supreme Court held that even if education was not a fundamental right under the federal constitution, it clearly was so under the California constitution (*Serrano v. Priest*, 1971 as cited in Rebell, 2006). While this judicial restraint at the national level provided more decision-making for state policy makers, it may have opened the door for increasing litigation at the state level surrounding school finance and equity. As expected, more than a decade later, another major legal challenge to the state's school finance system emerged, although this time plaintiffs alleged that the funding practices violated state law rather than federal law.

**Statement of the Problem**

The winds of change revealed an increasing number of cases challenging state education finance systems on various grounds along with a shift from equity to adequacy as the legal focus. States have scrambled to formulate policies in compliance with judicial decisions. In response to challenges and subsequent rulings, state legislatures were required to create new educational finance plans that would meet the requirements deemed necessary by the court's rulings. In fact, over the past forty years, more than 125 court cases have been filed challenging the constitutionality of school district and school spending levels. Podgursky, Smith, and Springer (2008) wrote:

> Of these challenges, twelve states have had their state funding mechanisms ruled unconstitutional on equity grounds and 23 states have had their state funding mechanism ruled unconstitutional on adequacy grounds. Only five states including Delaware, Hawaii, Mississippi, Nevada, and Utah, have not had their state school funding mechanisms adjudicated in the courts. (p. 176)

Despite the increase in plaintiff victories in light of adequacy claims over the last two decades, Glenn (2006) cautioned that these suits are generally not filed to achieve improvement across the board for all students. Rather, "Litigants seek to attain a social justice result related to a differential improvement in achievement of students living in poverty and children of color. Such an improvement would serve the objective of reducing or, ideally, eliminating the achievement gaps that plague the nation" (Glenn, 2006, p. 68). Adequacy litigation seeks to improve education by providing additional resources. As Glenn (2006) explained, "The reliance on money to cure all of the defects present in school flies in the face of *Brown* (1954) and the evidence that

shows money and resources alone cannot equalize education" (p. 69). Given the nature of adequacy lawsuits, it seems likely that improvements in student outcomes and possibly performance for minority students and students in poverty are possible. While it is apparent that litigation on school finance has resulted in an increase in the overall spending in public schools and has helped reduce funding disparities among school districts in many states, it is not so clear how the increased spending has affected student achievement, and more specifically, student achievement among low income and minority students (Glenn, 2006). According to Glenn (2009), "Numerous individuals and groups are working to eliminate two of the greatest injustices in American public education--the inequitable and inadequate distribution of educational resources and the persistent achievement gaps between various categories of students" (p. 247). While school finance adequacy litigation offers one such legal action used to seek fair outcomes for students, literature on the impact of such litigation on student outcomes is sparse (Glenn, 2006).

**Statement of Purpose**

The purpose of this study is to address the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. The study extends theory established in prior studies and takes into account the idea that change takes several years to realize and that sufficient time to fully implement the court's decision and to embark on a mission of reform may not have been possible with the two-year turnaround time provided for in past studies.

**Research Questions**

The following research questions guided the study:

1. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

2. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had a plaintiff victory in an adequacy lawsuit?

3. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

4. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?

5. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

6. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?

**Overview of Methodology**

To answer the research questions stated above, this study involved an analysis of the effects of adequacy litigation on student achievement as gleaned from NAEP data beginning the first year the test was administered and every year after that in which NAEP was given, ending with the most recent test administration in 2011. NAEP includes assessments in mathematics, reading, science, writing, the arts, civics, economics, geography, and U.S. history. These assessments follow the frameworks developed by the National Assessment Governing Board and use the latest advances in assessment methodology (NAEP, 2008, p.1). The sample included average scale scores that take into account the scores of 150,000 to 200,000 public school students from all states in the United States. Two variables representing adequacy litigation were coded. The coding was based on textual analysis of court cases, legal opinions, and school finance statutes (Glenn, 2006). Multiple regressions were used in the study to examine the relationships between the scale scores and three variables: time, the filing of an adequacy lawsuit, and plaintiff success in an adequacy lawsuit. Specific statistical procedures are more thoroughly described in Chapter III.

## Significance of the Study

Equity and adequacy remain the key components in studying finance systems. Researchers have presented varying definitions of the two terms and have attempted to measure aspects of each in relation to state finance systems of education. Much of the attention has been instigated by the waves of litigation that have focused so heavily on the importance of providing an equitable, adequate education for all students. While standards for determining the extent to which states provide this standard of education have changed over time, the focus continues to be on educational reform and the examination of key concepts related to improving opportunities for students.

This study sought to dissect the complex nature of adequacy litigation to determine if there is an impact on student achievement. Piecing together parts of this multifaceted puzzle will inform future work in school finance reform and in educational reform in general.

## Theoretical Framework

In examining educational research and legal research in the area of school finance, I reviewed the literature that contributes to our understanding of school finance litigation and the tangible impact that it has had on student achievement using thematic analysis. Given the tremendous amount of literature published on school finance reform, school improvement, closing the achievement gap, and the role of the courts in education, the literature included is not necessarily exhaustive on these topics. In choosing appropriate literature sources, the search included historical educational information, legal information, and relevant court cases to begin framing the issue of school finance litigation. In addition, it was important to investigate more recent court

decisions that provided a lens for examining adequacy and equity lawsuits and the impact of such litigation on student achievement.

Once the literature was selected for review, textual thematic analysis was incorporated to identify trends across states in litigation and the impact on student achievement. Thematic analysis provided context for making sense of materials, analyzing qualitative information, systematically observing people and situations, and converting qualitative information into quantitative data (Boyatzis, 1998). According to Boyatzis, thematic analysis is a process for encoding qualitative information and begins with perception of a pattern. A theme is a pattern found in the information that at a minimum describes and organizes possible observations or at the maximum interprets aspects of the phenomenon (Boyatzis, 1998). The themes that emerged throughout the course of the textual analysis helped organize data and observations related to school finance litigation and student achievement. The themes included equity, adequacy, equity and adequacy in the courts, models for estimating adequacy, measuring equity, and the tangible impact of litigation on student achievement. The resulting themes served as a guide for conducting a quantitative analysis driven by the research questions on such a complex issue to verify or to extend the findings existing in related studies.

**Limitations of the Study**

One limitation of this study is the data source that was used. This study involved an analysis of the effects of adequacy litigation on student achievement as gleaned from the National Assessment of Educational Progress (NAEP) data. NAEP includes assessments in mathematics, reading, science, writing, the arts, civics, economics, geography, and U.S. history. These assessments follow the frameworks

developed by the National Assessment Governing Board and use the latest advances in assessment methodology" (NAEP, 2008, p.1). According to Glenn (2006), the NAEP provides an ideal source of data for this research "because it is the most respected national assessment of educational outcomes; it contains a wealth of information on student, family, teacher, and school characteristics; and its large sample size make it more capable of permitting the generalization of findings" (p. 70).

However, the NAEP is based on a framework rather than on a set of learning standards for students. Samples of students in grades four, eight, and twelve are selected from states to take only a portion of the assessment. The results are then combined to derive state averages and compare results across all states. As with any single assessment, it is difficult to ascertain the precise achievement of students using only the information obtained from this sample of questions and students across states. In the absence of another assessment that is consistent across all states, NAEP represents the best method of comparison that is publicly available.

**Assumptions**

According to Ethington (1991), "Within all subject matter areas, researchers have consistently sought to identify the determinants of achievement and to understand how these determinants influence various achievement outcomes" (p. 156). The concept of student achievement is sometimes elusive in determining precisely what characteristics to measure and how to do so. Nonetheless, the focus on assessing student achievement in the classroom has grown exponentially in response to increasing federal and state accountability aspects in education. While all states have assessments by which to gauge student learning and mastery of concepts and skills, there is currently

not a common assessment given to all students across the country that measures learning against a common set of standards. NAEP is the most comprehensive assessment that is currently administered across all states that allows for some comparisons to be made in grades four, eight, and twelve.

Despite the limitations of the NAEP data source, it is considered to be "the most respected national assessment of educational outcomes; it contains a wealth of information on student, family, teacher, and school characteristics; and its large sample size make it more capable of permitting the generalization of findings" (Glenn, 2006, p. 70). The data can be disaggregated by student subgroups. In this study the assumption is that NAEP represents student achievement in terms of educational outcomes and is the best measure for comparing results across all states.

**Definitions**

Achievement for the purposes of this study refers to the level of student proficiency as measured by a change in student outcomes using scale scores on the National Assessment of Educational Progress (Glenn, 2006).

Adequacy in this study is a level of resources sufficient to achieve defined, absolute educational results (Conley and Picus, 2003).

Equity is a situation in which students' educational outcomes are affected as little as possible by their socioeconomic status (Wenglinsky, 1998).

**Summary**

This chapter provided a brief overview of the concepts of equity and adequacy. A description of the connections between the two terms and ongoing litigation in school finance was also included. The need for the study, which is developed within the

problem statement, focused on the sparse literature directly linking adequacy litigation with measurable differences in student achievement and the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. The research questions were derived from this need, and a brief overview of the methodology that will be used in the study was also included. Limitations of the study as well as assumptions were discussed in this chapter.

Chapter II will provide a review of literature related to school finance litigation. Chapter III will describe the research procedures used to address the questions posed in this study, while Chapter IV will present findings and an analysis of the data. Finally, the paper will culminate in Chapter V with a discussion of the findings, conclusions, and implications of the study.

Chapter II

# Review of Literature

The current study provides an exploration of the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. The study extends theory established in prior studies and takes into account the idea that change takes several years to realize, while sufficient time to fully implement the court's decision and embark on a mission of reform may take years to realize. The previous chapter provided an overview of the concepts of equity and adequacy and the nature of litigation as it relates to the two terms. The current chapter includes a review of literature in the areas of equity and adequacy, including the presence of both concepts in the courts and in determining the tangible impact of litigation on student achievement.

## Overview

School finance policy surrounds the constructs of equity and adequacy. According to Springer, Liu, & Guthrie (2008), "In its broadest sense, school finance equity specifies that equally situated children should be treated equally" (p. 1). Adequacy, in contrast, "prescribes that the level of educational resources made available be sufficient to provide all students opportunity to reach, at a minimum, a stated standard level of proficiency" (Springer et al., p. 1). As districts seek to operationalize the terms, "equity refers to fairness in the distribution of educational goods and services while adequacy means that the allocation of resources should vary according to certain educational needs of students so schools can respond to those students' needs" (p. 1).

## Conceptual Framework

As noted in Chapter 1, coding and theming were used to organize and analyze the literature. The emerging themes resulted in specific concepts that were used to construct research questions to confirm or disconfirm notions about school finance litigation and the relationship to student achievement. The following sections reflect the themes that emerged and their connection to the research questions presented in the study.

## Equity

The pursuit of equity in education has been a moving target for policymakers in a quest for educational reform. One of the most prominent attempts can be traced back to the 1954 *Brown v. Board of Education* decision. The United States Supreme Court held that each state, in providing the opportunity for education, must make it available "to all on equal terms" (*Brown v. Board of Education*, 1954). Ongoing reform efforts and policy changes have taken place over time, and Jordan (2010) acknowledged, "Yet creating a system of education where all children have equal access to quality instruction and widely available opportunities to learn to their fullest human potential has been elusive" (p. 142). With federal and state accountability requirements, student performance is now a primary focus and school finance policies have been under scrutiny, as efforts are aimed at closing achievement gaps. Jordan further elaborated on the shift in assessing equity.

> From a historical perspective, the language of *Brown* situated the equity discourse as a mandate to provide educational opportunities to all students, with

the unstated aim to help all children, regardless of racial or ethnic background, to reach the similar educational and career goals. (p. 171)

While equity has been the focus of recent reform efforts, the connections between the goals of policymakers and the tangible outcomes have been called into question. "However, NCLB-like assessment systems frame the debate fully in terms of outcomes. But the question remains about whether outcomes and opportunities can be equalized in the same way" (Jordan, 2010, p. 171).

Illustrating the grave realities of the achievement gap, Darling-Hammond (2007) explained, "Only about 17% of African American young people between the ages of 25 and 29—and only 11% of Hispanic youth—had earned a college degree in 2005, as compared with 34% of White youth in the same age bracket" (p. 318). The effects are far more reaching than education alone. "In 2000, there were an estimated 791,600 African American men in prison or jail, and 603,000 in higher education" (Darling-Hammond, 2007, p. 318). Looking back, Lee (2009) contended, "Segregated public schooling was the legal normative practice in the United States until the 1954 *Brown v. Board of Education* Supreme Court decision and remains the *de facto* practice in many urban school districts today" (p. 65).

In addressing the complexities of the factors contributing to the achievement gap, researchers have attempted to connect funding with educational outcomes. Darling-Hammond emphasized this relationship by stating, "Educational outcomes for students of color are much more a function of their unequal access to key educational resources, including skilled teachers and quality curriculum, than they are a function of race" (p. 320). Inequalities in resource distribution and the accessibility of key

curricular and instructional materials has spurred litigation in an attempt to level the playing field and to establish an equitable system of education for all students.

Many definitions of equity have been offered by scholars, researchers, and policymakers alike. Jordan (2010) explained, "What is equitable and fair can be better understood in relationship to other things and from within a given context. In other words, perspectives of equity may vary among diverse groups and may be linked to culture" (p. 147). Wenglinsky (1998) defined equity as "a situation in which students' educational outcomes are affected as little as possible by their socioeconomic status" (p. 269). Going back to earlier studies, Sherman (1981) proposed four different components as a framework for analyzing equity:

> First, the group, from whose perspective equity is evaluated; second, the treatment, which is to be equitably distributed; third, the criterion, which specifies the broader equity principle that will be used to relate the group to the treatment; and fourth, the measure, which converts the broad equity principle into a numerical summary statistic. (p. 6)

**Adequacy**

As with equity, researchers have proposed different definitions of adequacy. Odden, Picus, and Goetz (2010) defined adequacy as "…providing a level of resources to schools that will enable them to make substantial improvements in student performance over the next four to six years as progress toward ensuring that all, or almost all, students meet their state's performance standards in the longer term" (p. 630).

Hanushek (1994) provided several possible descriptions of adequacy. At a basic level, adequacy addresses a minimal set of resource needs. More complicated accounts of adequacy begin with a notion of outcome goals and then define resources needed to work toward the outcome goals (Hanushek, 1994). Hanushek further contended that based on these accounts, it is possible to have an equitable system that is inadequate because the overall resources may be insufficient to meet some desired outcomes. Most schools meet the minimum requirements set forth in areas that may include safety, curriculum, transportation, and facilities. However, "It is the very broad midrange of schools where the majority of spending goes and where there are no obvious defects that is important" (p. 466). A compounding issue is that it is difficult to tie funding directly with student performance. For example, it is not easy to assign a price to an adequate teacher versus a high quality teacher or to assign a cost with a continuum of services offered, ranging from just above minimal expectations to superior. As a result, tracking spending directly to individual students and certain performance outcomes presents a great challenge.

Adding another dimension to this already complex puzzle, Reyes and Rodriguez (2004) asserted that adequacy refers to how educational inputs along the focus of school finance litigation can be tied directly to specific academic outcome expectations. Conley and Picus explained that adequacy can be considered to be a level of resources sufficient to achieve defined, absolute educational results (2003). Adequacy definitions can even include the means by which results will be measured, including the use of inputs, outputs, and processes in between (Conley & Picus, 2003). In fact, Clune

(1994) differentiated between equity and adequacy in that adequacy emphasizes outputs over inputs and shifts the focus away from equal resources for all students.

States have also produced different criteria for establishing adequacy. In a 2002 report submitted to the Legislative Coordinating Council in Kansas, the authors explained, "In defining a suitable or adequate education, states primarily use two types of measures of success: input and output measures" (Augenblick, p. III-1). Input measures focus on certain resources that should be provided to students. These may include curriculum, effective teachers, and course offerings. Output measures, on the other hand, focus more on student performance through the use of state assessments in a variety of subject areas and grade levels, graduation rates, and attendance rates (Augenblick, 2002).

Wyoming has used input measures in setting its adequacy level with a focus on specific activities, such as high school courses, that a student had to complete in order to be admitted to the Wyoming university system. In this model, student performance on state assessments has not been considered as a measure of adequacy (Augenblick, 2002). Other states, such as Illinois, have taken the opposite stance and use student performance on state tests as the main determinant of adequacy. In Illinois, school districts that met state measures on a number of tests were considered to be performing at an adequate level. The state measures include either an absolute standard, which means a certain percent of students meeting state goals on the tests, or a change over time standard to measure improvement (Augenblick, 2002). In Illinois, if a district improves at a level that keeps them on pace to achieve the absolute standard in a given period of time, their performance is considered adequate (Augenblick, 2002). The latter

approach falls in line with the adequacy definition presented by Odden et al. (2010) which focuses on improved student performance over time:

> Although specific targets might vary depending on the state and a school's current performance, this goal could be interpreted as raising the percentage of students who meet a state's student proficiency level from 35% to 70% or from 70% to something approaching 90% and in both examples to increase the percentage of students meeting advanced proficiency standards. (p. 630)

**Equity and Adequacy in the Courts**

"Over time, state and federal governments and the judiciary have become primary forces in the development and expansion of the concepts of equity and adequacy in public education" (Verstegen & Whitney, 1997, p. 330). Superfine (2010) contended, "No matter what order a court issues in such cases or the number of times a court revisits a particular ruling, a variety of institutions and individuals, including legislatures, agencies, school districts, schools, and teachers, are generally implicated by the court's decision and called to action" (p. 108). Following the *Brown* cases, school finance cases arose to address one of the main causes of educational inequities. Resource disparities between different schools fell under a microscope of intense scrutiny and became the focus of equity lawsuits (Glenn, 2006). In response to the inequalities inherent in school funding systems, the finance equalization movement surfaced in the late 1960s (Wenglinsky, 1998). Because the majority of education was financed through local property taxes, much of the available funds depend on the level of wealth in the school district, which in turn, depend on the relative affluence or poverty of the residents in the district, as well as on the value of commercial property

(Wenglinsky, 1998). "When the perceived poor quality of a school district helps depress its property values, its board needs to increase millage rates just to maintain flat revenue" (Martin, 2006, p. 819). The impact on districts can be lasting. Martin (2006) further explained, "For districts caught in the cycle of low performance, low property values, and high property taxes, it is hard to gain traction on any front" (p. 819). As a result, the students in a district with more wealth could, in theory, receive a higher quality education, while students of lower socioeconomic status might have fewer educational opportunities based on the availability of resources in the district.

Whereas the desegregation cases following *Brown* were primarily a federal matter, school finance equity cases originally surfaced at both the federal and state levels. The form of school finance litigation has evolved, but the underlying principles have remained fairly constant. Characterizing the transition over time, Superfine (2009) indicated that school finance litigation has appeared in three different waves in which "the legal arguments of plaintiffs and the general approach taken by courts toward educational resources underwent important changes" (p. 487). Originally, this theory emerged as a result of research conducted by Thro (1994) in his effort to analyze judicial decision-making. Thro (1994) rationalized, "Each wave has its own identifiable set of characteristics with respect to legal theory, methods of judicial analysis and the plaintiffs' success rate" (p. 598). Equity was the underpinning by which cases were initiated in the first two waves. "First-wave plaintiffs generally argued that, under the U.S. Equal Protection Clause, education is a right that must be provided equally to all students and that the government cannot discriminate between students on the basis of wealth" (Superfine, 2009, p. 487). More specifically, plaintiffs challenged the

constitutionality of school aid systems alleging that disparate state finance systems violated the equal protection clause (Verstegen & Whitney, 1997). In essence, their arguments contended that because of disparities in educational funding, students who live in poorer districts received different treatment from those students residing in affluent districts. Additionally, the lower funding in the poorer districts deprived the students in those districts of an education (Verstegen & Whitney, 1997). Using the rational relationship test, the disparity of funding was upheld using the lowest standard of review in *San Antonio Independent School District v. Rodriguez* (1973). It was not until after the Supreme Court removed the federal basis and rejected this claim in *Rodriguez* (1973) that the number of state cases began to increase (Glenn, 2006).

Still focused on equity, the second-wave of litigation included arguments based on equal protection clauses and education clauses in state constitutions (Superfine, 2009). A key case that was decided just prior to *Rodriguez* was *Serrano v. Priest* (1971). The California Supreme Court found that education was a fundamental right under the state constitution and spending disparities in the state finance system discriminated against the poor students (*Serrano v. Priest*, 1971). This case also set the stage for the second wave of court cases initiated in state courts. The state applied the equity system, or equal treatment of equals, and found the system was unconstitutional "both with respect to the provision of services and with respect to the geographic distribution of the tax burden" (*Serrano v. Priest,* 1971). According to Verstegen and Whitney (1997), "Although equals must be treated equally (horizontal equity), unequal treatment of unequals (vertical equity), was also necessary to reach equity when

circumstances warranted, that is, when the classification for differential treatment was justified, legitimate, and educationally relevant" (p. 334).

Just after the *Rodriguez* decision, *Robinson v. Cahill* (1973) was decided in New Jersey. Based solely on the state education article, the state finance system was determined unconstitutional. According to the court, unequal funding among school districts in New Jersey violated the state constitution's "thorough and efficient" requirement for a system of free public education. In turn, the responsibility fell on the state to assure that all students received an equal educational opportunity (Verstegen & Whitney, 1997). As the court's decision echoed throughout the country, a new series of court cases arose, charging that school aid systems violated requirements of state education articles. Another similar case, *Horton v. Meskill* (1977), was tried in Connecticut. The court found that education was indeed a fundamental right and invalidated the school finance system. The rationale for this decision rested in the premise that children in property-poor districts received less money than those in property-rich districts. In linking expenditures with the overall quality of an education system, the court indicated that additional money was required for providing an optimal version of the state standards (*Horton v. Meskill*, 1977).

In Wyoming, the education article in the state constitution called for a "complete" and "uniform" system of public education (*Washakie Co. v. Herschler*, 1980). While acknowledging that factors other than money are involved in imparting education, the court stated, "It is our view that until the equality of financing is achieved, there is no practicable method of achieving equality of quality" (*Washakie Co. v. Herschler*, 1980, p. 334). The court went on to explain, "We only proscribe any

system which makes the quality of a child's education a function of district wealth. We hold that exact or absolute equality is not required" (p. 336). Verstegen and Whitney (1997) summarized the impact of this decision by stating:

> The court implicitly held that equity and adequacy could not be severed because disparities in financial resources related to differences in the quality of education offered to schools and in classrooms. This required fiscal equity, where differences in funding were only permitted if justified by uncontrollable differences in pupil needs or district costs. (p. 336)

Just as with the cases in the first-wave, success for plaintiffs was limited in the second wave. From 1973 to 1982, of the seventeen state high-court decisions, seven overturned state finance systems and ten others upheld state plans for funding education (Verstegen & Whitney, 1997). While most would acknowledge that equity is desired, courts have struggled to determine precisely what aspects of finance should be equalized. Arguments have been presented stating a need for the equalization of a full range of variables, including per pupil expenditures, materials, physical structures purchased with school funds, and student performance (Superfine, 2009). In *Pauley v. Kelly* (1979), the importance of school facilities was cited as a reason for redistributing resources. In this case, the redistribution of resources in the pursuit of equity was based on three considerations (Jones, 2002). The considerations were summarized by Jones (2002):

> Poor districts should receive outside funds on the theory that residency should not deprive students of equal access to educational resources; ratios set for per pupil funding should be adjusted upward in poorer districts, when necessary, to

> counteract the effects of revenue imbalance; and tax schedules should ensure that tax payers residing in impoverished areas will not bear a disproportionately heavy tax load. (p. 28)

In analyzing the results of such cases and language articulated by the courts, the standards of equity and adequacy adopted by the courts are revealed. Verstegen and Whitney (1997) noted, "Serrano, Washakie, and Horton called for equity in educational resources. On the other hand, Robinson and *Pauley* elected to use an outputs standard. Verstegen and Whitney explained the differences inherent in the groups of cases:

> Overall, factors weighing heavily in plaintiff victories during the second wave of court challenges included the willingness of the court to find that the education article embraced education as a fundamental right that required some substantive level of education or equal opportunity. The level of judicial scrutiny was a chief consideration. However, the prevalent method of equal protection analysis employed in these cases was the rational relationship test, the most deferential level of review. When this test was used, as in *Rodriguez*, the legitimizing rationale for disparities in education funding was local control and the finance plan was upheld. (p. 337)

Superfine (2009) further noted, "Courts have also focused on the difficulty of finding clear empirical links between funding and student performance, and some courts have indicated that they are not competent to make decisions in such a technical field" (p. 488). Those cases whose outcomes were successful have often resulted in shifting funds from more affluent districts to less affluent districts. Such decisions have been the catalyst for additional lawsuits and mounting public controversy. Evidence of these

trends could be seen in Texas. In response to ongoing litigation and a complete overhaul of the state finance system, high-property-wealth school districts filed a lawsuit claiming that the provision of the education finance system that limits local tax rates violates the state constitution (*West Orange-Cove Consolidated ISD v. Nelson*, 2001). Courts dismissed many of the second-wave cases or in the case of the successful suits, provided little guidance to legislatures redesigning funding systems (Superfine, 2009).

Meeting mixed success in court, lawyers shifted focus. "Third-wave plaintiffs generally argued that state education clauses require states to devote a sufficient level of funds to enable students to receive adequate educations" (Superfine, 2009, p. 488). Rather than concentrating on equalizing per pupil funding, the adequacy cases involved giving schools the resources needed to educate each student up to an objective standard (Glenn, 2006). The first such case was *Rose v. Council for Better Education* (1989). This case originated on equity grounds on behalf of less affluent school districts, but the Kentucky Supreme Court took the case a step further, noting that the entire state education system was invalid because it was "inadequate and well below the national effort" (*Rose v. Council for Better Education,* 1989, p. 10). This case established a precedent for future decisions with respect to adequacy. Some courts were more detailed in outlining measures of adequacy, while others left this entirely to the legislature to decide as an overhaul of many state finance systems was mandated (*Rose v. Council for Better Education,* 1989). As a result of *Rose* (1989), Kentucky defined an adequate education as one that develops seven capacities:

> a. sufficient oral and written communication skills to enable students to function in a complex and rapidly changing civilization; b. sufficient knowledge of economic, social, and political systems to enable the student to make informed choices; c. sufficient understanding of governmental processes to enable the student to understand the issues that affect his or her community, state, and nation; d. sufficient self-knowledge and knowledge of his or her mental and physical wellness; e. sufficient grounding in the arts to enable each student to appreciate his or her cultural and historical heritage; f. sufficient training or preparation for advanced training in either academic or vocational fields so as to enable each child to choose and pursue life work intelligently; g. sufficient levels of academic or vocational skills to enable public school students to compete favorably with their counterparts in surrounding states, in academics or in the job market. (p. 10)

Other state constitutions call for different criteria. The language has ranged from equal-protection clauses, as in California, to provisions requiring an "efficient" school system (Texas, Kentucky) or a "thorough and efficient" school system (Ohio, New Jersey), to ones simply affirming the state's duty to provide "free public schools" (Missouri) or "to cherish . . . public schools" (New Hampshire) (Thomas, 1998, p. 27). In Texas, in less than three years, the state finance system was invalidated three times as a result of litigation on equity and adequacy grounds (Verstegen & Whitney, 1997). Likewise, Montana's state education system was found inadequate in providing students with not just a basic education, but a quality education (*Helena Elementary School District No. 1 v. State*, 1989). Disparities in access to curricula, instructional materials,

technology, and highly qualified staff were illustrated and a spending gap of 8:1 between rich and poor districts indicated unequal educational opportunities. Thus, the court determined that the state failed to provide all students with a quality education. This decision was particularly important because it increased the standard from a minimum to a quality education system as the basis for measuring claims against equity and adequacy.

With the evolution of school finance cases, some important trends began to emerge. According to Glenn (2006), "The plaintiffs regularly prevail in adequacy litigation, winning much more regularly than when equity was the primary issue in the cases" (p. 67). In fact, there has been a strong reversal in the outcomes of state court litigations: plaintiffs have, in fact, prevailed in the vast majority (18 of 29) of the major decisions of the states' highest courts since 1989" (Rebell, 2006, p. 9). Verstegen and Whitney (1997) noted that in cases where state finance systems have been upheld in court, a basic notion of adequacy has been found. "Conversely, in states where public education finance systems have been invalidated, constructs of equity could not be severed from constructs of adequacy as the courts call for a quality education for all children" (Verstegen & Whitney, 1997, p. 330).

Key rulings in Kentucky, Texas, Montana, and New Jersey paved the way for additional litigation in other states. In these rulings the court redefined "the constitutionally required level of education a state must provide from a minimum to a quality education;" relied on multiple criteria for measuring constitutional compliance using both input and output mechanisms "so that not only dollars but what dollars buy in terms of programs, services, outcomes, and budget flexibility have prominence in the

school finance debate;" relied on the plain meaning education articles in state constitutions; and focused on the concept of adequacy in addition to equity to call for reform through sufficient funding and the distribution of the funding (Verstegen & Whitney, 1997, p. 338). As standards for ensuring adequacy have risen in response to litigation, states have worked to adjust their finance systems accordingly and craft criteria for providing education up to a certain standard.

**Models for Estimating Adequacy**

Once definitions or criteria have been established, the challenge becomes measuring the extent to which the criteria have been met. An equally challenging component is estimating the costs associated with providing for adequacy in education. In other words, how does a district estimate the level of resources necessary to make substantial improvements in student achievement (Odden, Picus, & Goetz, 2010)? According to Conley and Picus (2003), "As attractive as the adequacy goal is in principle, it is much more difficult to define in practice" (p. 588). Studies have produced a variety of mechanisms for estimating adequacy. Among the most prominent are cost functions, professional judgment, successful schools and districts, and evidence-based approaches (Odden et al., 2010). Odden et al. (2010) developed the concept of the evidence-based approach, which "gives primary influence for making programmatic recommendations to research evidence" (p. 630). Odden et al. (2010) explained a practical application of the evidence-based approach to analyze state-by-state estimates of the cost of adequacy. With this model, the strongest programmatic recommendations are those supported by randomized trials and/or meta-analyses of effects, such as those recommending class sizes of 15 in Grades K-3 as well as

recommendations for tutoring and summer school. When such measures are not available, "Other recommendations are based on best practices and are often derived from the resource parameters of comprehensive school reforms. These include recommendations such as class sizes of 25 in Grades 4-12" (p. 631). Finally, "When there is little or no experimental research, which is the case in the use of guidance counselors and nurses, the evidence-based approach in this study relies on other peer reviewed research and/or recommendations from professional associations" (p. 631).

The researchers explained at this level, the model "relies on evidence for each individual recommendation and provides effect sizes from the research on the individual programs" (p. 631). The study produced state-by-state estimates that are derived by using the core recommendations of the evidence-based model. According to Odden et al. (2010), the recommendations offered in the model include full-day kindergarten, a limit on class size, specialist teachers, sufficient planning and preparation for teachers, sufficient staff support and leadership, an ambitious set of professional development resources, supervisory aides, a specified amount of funding for key instructional components and programs, specialized student support, effective intervention processes, and substitute teacher resources.

Because funds are distributed at the district level in nearly all states, funding formulas focus on districts, and studies have focused attention on analyzing the expenditures and adequacy measures also at the district level. As Odden et al. (2010) explained, "The evidence-based approach allows cost estimates and school finance formulas to be school based" (p. 634). Two different approaches are presented that both extend use of the evidence-based model. First, "By summing the cost of the resource

needs of the districts in a given state, the total cost of adequacy can be estimated and compared to current spending" (p. 638). Such a method is currently used in Wyoming to estimate the cost of adequacy at the school level. Other states used a slightly different approach to using the evidence-based model. In Arkansas, for example, a state which used the evidence-based recommendations to adjust its foundation program, an estimate of the average state cost is made by applying the recommendations to prototypical schools in a prototypical district with the statewide average demographics (p. 638). In the Odden et al. study (2010) of all 50 states, several findings are important to examine:

> Whether the costs are estimated using national average salaries for teachers or using state average teacher salaries, just more than half of the states do not provide enough funding at the present time to fully fund the evidence-based model, the others appear to spend more than the model suggests. (p. 649)

This finding can have a significant impact on policy making. Odden et al. (2010) continued on to explain, "If the 'excess' funds are not 'recaptured' from the high-spending states, which is the reasonable assumption, the cost of the evidence-based model could be achieved with a funding increase of just less than 13%" (p. 650). With the current economic situation, this estimate may appear impractical; however, over time, the figure may be reasonable. The issue becomes targeting the spending for appropriate areas of recommendation and adjusting costs based on student population and intra-district allocations. Nonetheless, this study is the first to estimate the costs of implementing such an adequacy model across all fifty states and can lead to additional studies to more thoroughly examine the concept.

Conley and Picus (2003) also explained different methods of determining school finance adequacy. Among the methods presented are "(a) economic cost function methods, (b) generalizing from costs of schools that meet performance benchmarks, (c) effective school-wide strategies or programs model, and (d) professional judgment approaches" (p. 588). The economic cost function method is similar in concept to the production function model. "In a cost function, the desired level of student performance is included as an independent variable in the regression, and the dependent variable is a measure of expenditures per pupil" (p. 589). The results produce an estimate of the funding needed to produce the desired level of student performance. The model takes into account differences in students' characteristics, district conditions, and differences in the costs associated with providing educational services to students. This method has been examined in Texas and Illinois, and evidence suggests that large urban school districts require funding levels two to three times higher than the average expenditure level for the rest of the state (Conley & Picus, 2003). Due to the complex statistical procedures involved in the cost function, this method has not been established as a favorite of policy makers. As a result, Conley and Picus noted that cost functions have not been used in developing any state's finance system.

A second method that is used, at least in part, in Ohio, Illinois, and Mississippi, identifies districts whose students have been successful in meeting state proficiency standards and sets the adequacy level at the weighted average of the expenditures of such districts (Conley & Picus, 2003). The model is based on the weighted average of all the expenditures of the districts meeting the performance benchmark to determine

the adequacy level. However, adjustments needed to account for varying student and district characteristics are potential sources of bias that many policymakers have pointed out. Additionally, neither this model nor the cost function model account for the distribution of funds at the school level.

To address the need to examine funds at the school level, the Effective Schoolwide Programs or Strategies model:

> takes research findings that describe a high performance school or a comprehensive school design, identifies all the elements needed to implement the design's educational strategies, calculates a cost for each of those elements, and then uses that figure to determine an adequate spending base for each school. (Conley & Picus, 2003, p. 590)

More specifically, the method "assembles a set of specific educational programs and strategies that represent state-of-the-art knowledge about education effectiveness and then puts a dollar figure on their costs" (p. 590). An application of this model was previously explained in the description of the Odden, et al. (2010) study. Benefits include the ability to determine the funding level using the school as the unit of analysis and the relationship between strategy and student performance based on research.

The fourth model presented by Conley and Picus (2003) is the professional judgment approach. Under this model, "the state constitutes teams of education experts who independently identify the educational resources needed to create schools in which educators have confidence that most of the students in the school will be able to meet the state-established performance goals" (p. 591). Typically, prototype schools are developed and then the costs of all of the resources needed to produce these

prototype schools are estimated and added together to determine the adequate fiscal base for a school. "An examination of its use can be seen in looking at individual states, as it was one approach used in developing Maryland's adequacy-based finance system in 2002" (p. 591). In addition, it is being used in Maine, Wyoming, and Oregon, with a number of states conducting studies using the model.

While it offers many advantages, it has been criticized for heavy reliance on professionals' judgment rather than gleaning information directly from research linking educational strategies with student performance and overall reform. Using this model in conjunction with other models can offer additional benefits in examining adequacy. Conley and Picus (2003) elaborated on their study findings on the Oregon Quality Education Model (OQEM), stating, "The OQEM demonstrates both the benefits and limitations of combining professional judgment and effective schoolwide strategies in adequacy models" (p. 609). While the researchers acknowledged limitations, they also asserted:

> In this case, OQEM connects several key components of state education policy: funding, school improvement, system performance, and accountability. In doing so, it provides a means to monitor and influence these factors. The OQEM operationalizes adequacy in a way that attempts to connect inputs and outputs and that leads to regular discussions of these connections in the policy arena. (p. 610)

**Measuring Equity**

The recent focus on adequacy stems from trends across states that have emerged in part due to the ongoing litigation. Past studies have also conceptualized equity and

attempted to measure it using a variety of mechanisms. Berne and Stiefel (1994) explained three equity principles, including equal opportunity, horizontal equity, and vertical equity. "We defined *equal opportunity* in terms of the relationship between school characteristics and a second variable, where in most cases the absence of a relationship signifies equal opportunity" (p. 405). Inputs, outputs, and outcomes can all be considered in terms of school characteristics. As seen in many of the court cases initiated on equity grounds, differential tax capacity is often associated with equal opportunity. However, within districts, the concerns center around the distribution of resources with respect to race, gender, and ethnicity (Berne & Stiefel, 1994). Berne and Stiefel contended, "*Horizontal equity,* or the equal treatment of equals, might take on real meaning at the school level, in terms of financial resources and output measures" (p. 406). When considering funding, "general education spending provides an equal base for all students, whereas the other funding streams are to be used differentially across students" (p. 406). Berne and Stiefel extended this idea and asserted, "Thus, horizontal equity could provide a valid criterion upon which to evaluate the equity of general education funding" (p. 406).

Vertical equity refers to the appropriately unequal treatment of unequals, such as students with disabilities or English language learners. Students with such needs require different resources to achieve learning goals. As a result, schools who have higher concentrations of students with these characteristics "would need more resources to achieve appropriate learning (or other outputs) compared to schools with lower concentrations. Vertical equity measures will assess the degree to which those schools receive more resources per pupil" (p. 406). Berne and Stiefel (1994) studied the

intradistrict allocation of funds and resources based on the three equity principles. One interesting finding is presented:

> In the general education category, poorer subdistricts receive more funds per pupil in nonallocated, district office, and indirect categories, but not usually in allocated and direct categories. This is consistent with the claim by many school districts across the country serving poor children that nonclassroom management and oversight burdens are substantial. The policy question is whether these results are necessary or productive, and whether ways can be found to get more resources to poor children. (p. 419)

Equally important to note is the difference in the relationship between general education resources and poverty at the middle school versus the elementary school level. The study, overall, points to the importance of studying resource allocations within districts.

**Tangible Impact on Student Achievement**

Equity and adequacy remain the key components in studying finance systems. Researchers have presented varying definitions of the two terms and have attempted to measure aspects of each in relation to state finance systems of education. Much of the attention has been instigated by the waves of litigation that have focused so heavily on the importance of providing an equitable, adequate education for all students. While standards for determining the extent to which states provide this standard of education have changed over time, the focus continues to be on educational reform and the examination of key concepts related to improving opportunities for students.

While school finance litigation on both equity and adequacy grounds has occurred in many states, its effectiveness remains questionable due to lack of a study

relating finance litigation to student outcomes (Glenn, 2009). Glenn (2009) noted, "In order to study the link between school finance litigation and student outcomes, one must compare outcomes for groups of students affected by the litigation with those of students that were not" (p. 249). Commonly, test scores are used to compare student outcomes; however, because a different assessment is used in each state to measure student proficiency according to standards, historically, researchers have faced the challenge of how to analyze student outcomes across states. Ludwig (1999) pointed out, "Despite an enormous body of empirical research, there is currently little consensus about whether additional education spending will, on average, improve student test scores, the most commonly used measure of student learning" (p. 385).

Aims of researchers in this area have taken on two main forms. The first is analyzing student outcomes within a single state that have been impacted by litigation. As Glenn (2009) explained, the Abbott districts in New Jersey as compared to students in the rest of the state, represents an example of this type of study. After a series of legal challenges, the Supreme Court in New Jersey mandated in the Abbott cases that the poorest districts must spend at least the same amount as the state's wealthiest districts (Bao, Romeo, and Harvey, 2010). As a result, New Jersey has adjusted the structure of their school finance system so that millions of dollars in parity funding have been spent to rectify the disparity among the poor and rich districts. According to Bao et al. (2010), "However, one cannot assume that equal funding for different school districts is a desirable goal, especially when school districts from different SES are spending their monies differently" (p. 347). It is important to conduct a detailed analysis of how the funds are spent in order to assess the degree to which the

reallocation of money affects students. As Bao et al. (2010) indicated, the funding disparities among districts may represent only a small portion of the inequity present.

Similarly, an earlier study by Coate and VanderHoff (1999) examined the relationship between the level of funding and high school achievement in 1988 and 1994 with regard to the ongoing litigation in New Jersey. They found no relationship between the expenditures and student outcomes. In a synthesis of this study, Glenn (2009) noted, "The study focused on high school achievement, even though the New Jersey Supreme Court directed much of the remedial efforts toward early childhood education" (p. 250). Changes in student performance at the high school level that were a result of redirected spending for early childhood would not have been apparent in the time span provided for in the study. In a later study focused on the Abbott districts in New Jersey, Ritter and Lauver (2003) concluded that higher funding did not translate into improved student outcomes. Proficiency rates among students in the Abbott districts remained low when compared with different student groups across the state.

An examination of trends in Virginia reveals similar findings. Verstegen and Salmon (1989) concluded that after a major shift in the school finance aid formula, changes in equity performance resulting from legislative mandates were actually worsened. In Texas, after an ongoing battle for school finance reform, Thompson and Crampton (2002) suggested, "The Texas research suggests that legislatures, forced by courts to amend school finance laws, may choose to fiercely resist" (p. 144). In summary, in looking at studies that involve measuring the impact of school finance litigation on student achievement within single states, two conclusions continue to surface. Thompson and Crampton (2002) summarized, "First, most studies do not show

a clear trend of improved equity, regardless of whether a lawsuit was won, lost, or even filed" (p. 148). While this conclusion focused on the equity aspect, the theory can also be extended to address adequacy concerns as well. "Second, the majority of studies suggests that nearly as much change in formula design may result from voluntary legislative reform as from court-ordered reform" (p. 144). With intense scrutiny on reforming school finance within states, legislatures have felt pressure to respond. The judicial presence in the process may have augmented such pressure serving as the catalyst for creating change.

Because school finance litigation mainly operates at a state level, one cannot generalize results from a single state and apply them to all states that have faced litigation in school finance. While a number of studies have been conducted looking at single state analyses, studies at the national level have been fewer in number (Thompson & Crampton, 2002). According to Glenn (2009), "National studies have shown a small, positive relationship between school finance litigation and student achievement" (p. 250).

One such study conducted by Verstegen (1993) concluded that court-ordered reform produced positive impacts, some of which included improved curricula, funds for teacher incentives, and additional use of achievement testing. Similarly, Downes and Figlio (1998) found, "Court-mandated and legislatively mandated school finance reforms have led, on average, to increased student performance" (p. 34). Glenn (2006) used the National Assessment of Educational Progress (NAEP) to examine the impact of adequacy litigation. A positive relationship between a successful adequacy lawsuit and NAEP scores was realized for both the entire sample of students and African

American students. In Glenn's later study (2009), results suggested that adequacy litigation may contribute to improved student outcomes for students from low socioeconomic status backgrounds, particularly in cases where the plaintiffs were successful in court.

While past studies have attempted to tangibly impact litigation on student outcomes, Thompson and Crampton (2002) offered the following statement: "The overall observation of direct effects litigation studies favoring a positive impact of lawsuits is that such works are relatively scarce and are almost always cautious in their findings" (p. 156). The purpose of this study was to address the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. The study extended theory established in prior studies, taking into account the idea that change takes several years to realize and that sufficient time to fully implement the court's decision and to embark on a mission of reform may not have been possible with the two-year turnaround time provided for in past studies. Fullan (2000) found that school improvement surfaces in elementary schools in about two to three years. However, in high schools, a five to six year time frame is more likely to yield change. Meanwhile, districts, depending on size, can take six to eight years for large-scale reform efforts to take effect. Fullan further contended that due to a lack of research, it is unclear how long it would take entire states or countries to realize change as a result of large-scale reform. Measuring change beyond the initial investment takes years.

This study included a four-year time frame between the initial events, which in this case, include the filing of the adequacy case, a plaintiff victory, and the point at

which student achievement results were examined. Applying Fullan's time guidelines, four years should be sufficient to realize some gains using achievement scores from a sample of fourth and eighth grade students, given that school finance litigation and ensuing reform within states are considered large-scale reform. While the successes may not be thoroughly institutionalized, there is likely to be some measure of improvement in a three- to five-year span of time (Fullan, 2000). Similarly, Hargreaves and Goodson (2006) differentiated between the initial gains on test scores that are often attributed to even the most tightly coordinated reform efforts and proceed to plateau after two years and true improvement as a result of educational change. Using this logic, analyzing student achievement after four years rather than two allowed for a greater perspective on the true impact of the litigation on student achievement.

**Summary**

This chapter situated equity and adequacy in the context of the courts and provided background on relevant legal precedent, as well as an overview of key studies that have examined the relationship between the litigation and student achievement. As Thro (1994) established, school finance litigation can be categorized in three distinct waves. "Although each wave has profound implications for American education, the most significant wave, in terms of cases, numbers of plaintiffs' victories and amount of substantial change, is the current third (post-1988) wave of cases" (Thro, 1994, p. 598). In examining such adequacy cases over time, it is apparent that this kind of research on the overall impact of the litigation on student achievement is sparse. While a number of studies have been conducted looking at single state analyses, studies at the national level have been fewer in number (Thompson & Crampton, 2002). According to Glenn

(2009), “National studies have shown a small, positive relationship between school finance litigation and student achievement” (p. 250). This study extended examination of this theory and further verified the connection between successful adequacy litigation and student achievement using a quantitative approach. Chapter III will provide details regarding the research design and methodology used to answer the research questions.

Chapter III

# Research Design and Methodology

The previous chapter provided background on relevant legal precedent, as well as an overview of key studies that have examined the relationship between litigation and student achievement. To further examine this relationship in depth, Chapter III provides an overview of the current study, followed by the methodology that will be utilized to gain insight into the relationship between litigation and student achievement. This chapter is divided into four sections. The first section describes the purpose of the study and the research questions within the study. The second section provides a delineation of the procedures for collecting data and the methodology that will be utilized. The third section includes a rationale for the methodology, and the fourth section provides a summary of the chapter.

## Purpose and Research Questions

As stated in Chapter I, the purpose of this study was to address the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. The study extended theory established in prior studies and considered the idea that change takes several years to realize, assuming that sufficient time to fully implement the court's decision and to embark on a mission of reform may not have been possible with the two-year turnaround time provided for in past studies. The purpose of this chapter is to describe the procedures that were utilized in this study to answer the following research questions:

1. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

2. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had a plaintiff victory in an adequacy lawsuit?

3. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

4. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?

5. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?

6. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?

**Data Collection and Methodology**

This study involved an analysis of the effects of adequacy litigation on student achievement as gleaned from longitudinal National Assessment of Educational Progress (NAEP) data. The data source is based on assessments given to students in mathematics, reading, science, writing, the arts, civics, economics, geography, and U.S. history. "These assessments follow the frameworks developed by the National Assessment Governing Board and use the latest advances in assessment methodology" (NAEP, 2008, p.1). According to Glenn (2006), the NAEP provides an ideal source of data for this research "…because it is the most respected national assessment of educational outcomes; it contains a wealth of information on student, family, teacher, and school characteristics; and its large sample size makes it more capable of permitting the generalization of findings" (p. 70).

The sample included 150,000 to 200,000 public school students from all the states in the United States as represented by average scale scores on a given section of NAEP. The Main Data Explorer provides national and state results for each year the NAEP has been administered since 1990 in 10 subject areas, including mathematics, reading, writing, and science (National Center for Education Statistics, 2012). This study explored only data from mathematics and reading because they are the two

subjects that have been emphasized the most in examining student achievement over time.

Using an Excel spreadsheet, each state was listed in a column with two variables representing adequacy litigation were coded and listed next to each state. The first category coded was lawsuit filed, which indicates whether or not a school finance lawsuit was filed between 1989 and 2007. Because the study focuses on adequacy litigation, 1989 provides a point at which to begin the analysis as it marks the advent of the adequacy era, or third wave of litigation, in school finance. The second category, lawsuit successful, indicates whether the plaintiffs prevailed in the highest court that considered the issue during the specified time period. The coding was based on textual analysis of court cases, legal opinions, and school finance statutes (Glenn, 2006). Multiple court cases were examined to determine the appropriate coding under the categories, suit filed and plaintiff success. After researching the legal history of adequacy claims in each state, the year in which the first major adequacy lawsuit was filed served as a basis for the coding.

A four-year turnaround time, based on the theory that change takes several years to realize, served as the basis for assigning the coding, which was used to indicate the filing of a lawsuit and a plaintiff victory. The study extends theory established in prior studies and considers the premise that change takes several years to realize, and that sufficient time to fully implement the court's decision and embark on a mission of reform may not have been possible with the two-year turnaround time provided for in past studies. Fullan (2000) asserted that school improvement surfaces in elementary schools in about two to three years. However, in high schools, a five- to six-year time

frame is more likely to yield change. Meanwhile, districts, depending on size, can take six to eight years for large-scale reform efforts to take effect. Fullan further contended that due to a lack of research, it is unclear how long it would take entire states or countries to realize change as a result of large-scale reform. Measuring change beyond the initial investment takes years.

In this study, a four-year time frame was considered between the initial events, which in this case included filing of the adequacy case and a plaintiff victory and the point at which student achievement results were examined. Applying Fullan's (2000) time guidelines, four years should be sufficient to realize some gains using achievement scores from a sample of fourth and eighth grade students, given that school finance litigation and potential reform within states is considered a large-scale reform. While the successes may not be thoroughly institutionalized, there is likely to be some measure of improvement in a three- to five-year span of time (Fullan, 2000). Similarly, Hargreaves and Goodson (2006) differentiated between the initial gains on test scores that are often attributed to even the most tightly coordinated reform efforts and proceeded to plateau after two years and true improvement as a result of educational change. Using this logic, analyzing student achievement after four years rather than two would allow for a greater perspective on the true impact of the litigation on student achievement.

For example, in, Alabama, *Alabama Coalition for Equity, Inc. v. Hunt* (1993), was the first major lawsuit filed based on adequacy claims in the state. While the judicial decision was delivered in 1993, the case was actually filed in 1991. Therefore, from 1989-1994, Alabama was assigned a code of 0 in the categories of suit filed and

plaintiff success. Beginning in 1995, Alabama was coded a 1 under suit filed to represent the four-year turnaround between the filing of the lawsuit and the time that would allow for this change to be realized in terms of student achievement. In this case, the lawsuit was decided in favor of the plaintiffs as evidenced in the Court's 1993 decision. As a result, beginning four years later, in 1997, Alabama was coded a 1 in the plaintiff success column.

The baseline year to begin the examination of adequacy claims was 1989 to correspond with the beginning of the third wave of cases that shifted from an equity focus to spotlight the issue of adequacy (Superfine, 2009). As a result, adequacy cases were analyzed across the fifty states beginning in 1989. There are a few exceptions to note. Thro (1994) characterized the third wave of school finance litigation as beginning with plaintiff victories in Montana, Kentucky, and Texas and hinging on the argument that the quality of education is inadequate as compared with the education clauses in individual states' constitutions. In Kentucky's *Rose v. Council for Better Education* (1989), the Court determined that the entire system of funding schools was unconstitutional. The court ordered the General Assembly to re-examine the state system and provide funding "sufficient to provide each child in Kentucky an adequate education" (p. 26). This case stemmed from an initial 1985 filing by 66 rural Kentucky districts. Even though the 1985 case preceded the 1989 baseline year, *Rose* was considered to be the fundamental basis for adequacy reform in Kentucky and served as a precedent for future cases in other states. As a result of its significance, this case was used as the initial adequacy filing and subsequent plaintiff victory in the state of Kentucky.

Other exceptions to the 1989 baseline year were Minnesota, Montana, New Jersey, and Texas. New Jersey, Texas, and Montana are similar in nature to Kentucky in terms of the school finance history. In New Jersey, the first major focus on the adequacy of a student's education emerged in Abbott v. Burke (1985), which is commonly referred to as Abbott I. This case commenced 20 years of related litigation, and serves both as precedent for other cases and as the defining series of school finance litigation in New Jersey.

In Texas, *Edgewood Independent School District v. Kirby* (1989) was originally filed in 1984 challenging the constitutionality of school funding in the state. In the landmark decision, the Supreme Court of Texas held that the school funding mechanism violated the state constitutional provision requiring maintenance of an "efficient" system so as to achieve "general diffusion of knowledge" (p. 1). Like Kentucky, this case was filed prior to 1989, but has served as a fundamental basis for future school finance litigation in the state of Texas concerning both equity and adequacy claims and has also been signified by researchers as the beginning of the third wave of school finance cases. *Edgewood* became the premise for the "Robin Hood" system in Texas, which serves as an equalization policy using a recapture clause to distribute funding across the school districts in the state.

Likewise, in Montana, *Helena Elementary Sch. Dist. No. 1 v. State* (1989) served as the monumental case for the state concerning school finance inequity and inefficiency. This case focused on the equality of educational opportunity that was afforded to students under the state's education clause. The court overturned the state

finance system citing failure of the state to provide such opportunity due to the financing scheme.

While Minnesota is not known for the precedent-setting landmark cases that would influence other states' decision-making, it serves as an exception to the 1989 baseline year for a different reason. In Minnesota, over fifty school districts and ten parents brought suit in 1988 claiming that unequal school funding created disparities in educational opportunity which violated the Minnesota Constitution (*Skeen v. State*, 1993). The ultimate decision was that through the use of a rational basis test, the school finance system was upheld. This case established the adequacy of the state's finance system and discouraged others from bringing suits on similar questions of adequacy.

Also worth noting, in Michigan *Durant v. State* (1994) was filed and contained some components of adequacy questions. Unlike many of the other cases, this case was limited to specific areas, including the questions of whether or not special education and special education transportation state-mandated activities or services within the meaning of art, and whether or not the state match payment for school lunches was part of the state-financed proportion for the purpose of computing compliance with art. The limited scope of the questions and the fact that overall adequacy was not the issue in debate in this case, resulted in assigning a coding value of 0 to Michigan in the category of suit filed.

Table 1 illustrates each of the fifty states, the date that a lawsuit was filed on adequacy grounds beginning in 1989, with the few exceptions noted above, and the year in which a plaintiff victory on adequacy claims occurred. Next to these two columns are the corresponding first years in which the state received a coding of 1. This coding

was assigned four years after the suit was filed or the plaintiff victory occurred. Table 2 provides a summary of the court cases that were examined and considered relevant in determining the coding of the variables.

Table 1

*Dates of Lawsuits, Plaintiff Victory, and Coding*

| State | Suit Filed | Date Coded | Plaintiff Victory | Date Coded |
|---|---|---|---|---|
| Alabama | 1991 | 1995 | 1993 | 1997 |
| Alaska | 1997 | 2001 | 1999 | 2003 |
| Arizona | 1992 | 1996 | 1994 | 1998 |
| Arkansas | 1992 | 1996 | 2001 | 2005 |
| California | 2000 | 2004 | 0 | 0 |
| Colorado | 1999 | 2003 | 0 | 0 |
| Connecticut | 1989 | 1993 | 1996 | 2000 |
| Delaware | 0 | 0 | 0 | 0 |
| Florida | 1995 | 1999 | 0 | 0 |
| Georgia | 2004 | 2008 | 0 | 0 |
| Hawaii | 0 | 0 | 0 | 0 |
| Idaho | 1993 | 1997 | 0 | 0 |
| Illinois | 1999 | 2003 | 0 | 0 |
| Indiana | 2007 | 2011 | 0 | 0 |
| Iowa | 2002 | 2006 | 0 | 0 |
| Kansas | 2001 | 2005 | 2003 | 2007 |
| Kentucky | 1985 | 1989 | 1989 | 1993 |
| Louisiana | 1992 | 1996 | 0 | 0 |
| Maine | 1994 | 1998 | 0 | 0 |
| Maryland | 1994 | 1998 | 2005 | 2009 |
| Massachusetts | 1993 | 1997 | 1993 | 1997 |
| Michigan | 0 | 0 | 0 | 0 |
| Minnesota | 1988 | 1992 | 0 | 0 |
| Mississippi | 0 | 0 | 0 | 0 |
| Missouri | 1990 | 1994 | 1993 | 1997 |
| Montana | 1985 | 1989 | 2004 | 2008 |
| Nebraska | 1990 | 1994 | 0 | 0 |
| Nevada | 0 | 0 | 0 | 0 |
| New Hampshire | 1991 | 1995 | 1997 | 2001 |
| New Jersey | 1985 | 1989 | 1990 | 1994 |
| New Mexico | 1998 | 2002 | 1999 | 2003 |
| New York | 1993 | 1997 | 2003 | 2007 |
| North Carolina | 1994 | 1998 | 2002 | 2006 |
| North Dakota | 2003 | 2007 | 0 | 0 |
| Ohio | 1991 | 1995 | 1997 | 2001 |
| Oklahoma | 2007 | 2011 | 0 | 0 |
| Oregon | 1990 | 1994 | 0 | 0 |
| Pennsylvania | 1997 | 2001 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Rhode Island | 1994 | 1998 | 0 | 0 |
| South Carolina | 1993 | 1997 | 2005 | 2009 |
| South Dakota | 1994 | 1998 | 0 | 0 |
| Tennessee | 1993 | 1997 | 1993 | 1997 |
| Texas | 1984 | 1988 | 1989 | 1993 |
| Utah | 0 | 0 | 0 | 0 |
| Vermont | 1995 | 1999 | 1997 | 2001 |
| Virginia | 1991 | 1995 | 0 | 0 |
| Washington | 2006 | 2010 | 2007 | 2011 |
| West Virginia | 1995 | 1999 | 1997 | 2001 |
| Wisconsin | 1989 | 1993 | 0 | 0 |
| Wyoming | 1995 | 1999 | 1995 | 1999 |

Table 2
*Summary of Court Cases*

| State | Adequacy Suit Filed | Name | Plaintiff Success |
|---|---|---|---|
| Alabama | 1991 | *Alabama Coalition for Equity, Inc v. Hunt,* WL 204083 (Ala Cir 1993) | 1993 |
| Alaska | 1997 | *Kasayulie v. State*, 3AN-97-3782 CIV (Sept. 1, 1999) | 1999 |
| Arizona | 1992 | *Roosevelt Elementary School v. Bishop*, 179 Ariz. 233, 877 P.2d 806 (1994) | 1994 |
| Arkansas | 1992 | *Lakeview School Dist. #25 v. Huckabee*, 340 Ark. 481, 10 S.W.3d 892 (2000) | 2001 |
| California | 1999 | *Williams v. State,* Super. Ct. San Francisco County (settled August 2004) | 0 |
| Colorado | 1999 | *Giaradino vs. Colorado State Board of Education*, Case No. 98-CV-0246 (1999) | 0 |
| Connecticut | 1989 | *Sheff v. O'Neill*, 678 A.2d 1267 (1996), 678 A.2d 1267 (1996) | 1996 |
| Delaware | 0 | | 0 |
| Florida | 1995 | *Coalition for Adequacy and Fairness in School Funding v. Chiles* 680 So.2d 400 (Fla. 1996) | 0 |
| Georgia | 2004 | *Consortium for Adequate Sch. Funding in Georgia v. State of Georgia*, Civil Action File No. 2004-CV-91004 | 0 |
| Hawaii | 0 | | 0 |
| Idaho | 1993 | *Idaho Schools for Equal Educational Opportunity v. Evans (ISEEO)*, 850 P.2d 724 (1993) | 0 |
| Illinois | 1999 | *Lewis E. v. Spagnolo*, 710 N.E.2d 798 (1999) | 0 |
| Indiana | 2007 | *Bonner v. Daniels,* 885 N.E.2d 673 (Ind. Ct. App. 2008) | 0 |
| Iowa | 2002 | *Coalition for a Common Cents Solution v. Iowa*, No. N/A (Iowa Dist. Ct. filed April 2002) | 0 |
| Kansas | 2001 | *Montoy v. Kansas*, 275 Kan. 145, 62 P.3d 228 (2003) | 2003 |
| Kentucky | 1985 | *Rose v. Council for Better Education*, 790 S.W.2d 186 (Ky. 1989) | 1989 |
| Louisiana | 1992 | *Charlet v. State* (Consolidated with Minimum Foundation Program v. State), 713 So.2d 1199 (1998) | 0 |
| Maine | 1994 | *School Administrative District No. 1 v. Commissioner*, 659 A.2d 854 (Me. Sup. Ct. 1995) | 0 |
| Maryland | 1994 | *Bradford v. Maryland State Board of Education*, 387 Md. 353, 875 A.2d 703 (2005) | 2005 |
| Massachusetts | 1993 | *McDuffy v. Secretary*, 415 Mass. 545, 615 N.E.2d 516 (1993) | 1993 |
| Michigan | 0 | | 0 |
| Minnesota | 1988 | *Skeen v. Minnesota*, 505 N.W. 2d 299 (1993) | 0 |
| Mississippi | 0 | | 0 |
| Missouri | 1990 | *Committee for Educational Equality v. Missouri*, Case No. CV190-137-1CC (1993) | 1993 |
| Montana | 1985 | *Helena Elementary School District No. One v. Montana*, 236 Mont. 44, 769 P.2d 684 (1989) | 1989 |
| Nebraska | 1990 | *Gould v. Orr*, 244 Neb. 163, 506 N.W. 2d 349 (1993) | 0 |
| Nevada | 0 | | 0 |
| New Hampshire | 1991 | *Claremont School District v. Governor*, 138 N.H. 183, 635 A.2d 1375 (1993); *Claremont School District v. Governor*, 142 N.H. 462, 703 A.2d 1353 (1997) | 1997 |
| New Jersey | 1985 | *Abbott v. Burke*, 495 A.2d 376, 390 (1985)(Abbott I) *Abbott v. Burke*, 119 N.J. 287, 575 A.2d 359 (1990) (Abbott II) | 1990 |

| | | | |
|---|---|---|---|
| New Mexico | 1998 | *The Zuni Public School District et al. vs. State of New Mexico*, Case No. CV98-14-II (1999) | 1999 |
| New York | 1993 | *School Administrative District No. 1 v. Commissione*r, 659 A.2d 854 (Me. Sup. Ct. 1995); *Campaign for Fiscal Equity v. New York*, 100 N.Y.2d 893 (2003) (overruled 744 N.Y.S.2d 130) | 2003 |
| North Carolina | 1994 | *Leandro v. State*, 488 S.E.2d 249 (1997) | 2002 |
| North Dakota | 2003 | *Williston Public School District v. State* | 0 |
| Ohio | 1991 | *DeRolph et al. v. State*, 78 Ohio St. 3d 193, 677 N.E.2d 733 (1997) (DeRolph I) | 1997 |
| Oklahoma | 2007 | *Oklahoma Education Association v. State* OK 30, 158 P.3d 1058 (2007) | 0 |
| Oregon | 1990 | *Coalition for Equitable School Funding v. Oregon*, 311 Ore. 300, 811 P.2d 116 (1991) | 0 |
| Pennsylvania | 1997 | *Marrero v. State*, 709 A.2d 956 (1998) | 0 |
| Rhode Island | 1994 | *City of Pawtucket v. Sundlun*, 662 A.2d 40 (1995) | 0 |
| South Carolina | 1993 | *Abbeville Co. School District v. State*, 335 S.C. 58, 515 S.E.2d 535 (1999) | 2005 |
| South Dakota | 1994 | *Bezdicheck v. State, No. South Dakota Circuit Court*, Case No. CIV 91-209 (unpublished decision 1995) | 0 |
| Tennessee | 1993 | *Tennessee Small School Systems v. McWherter*, 851 S.W.2d 139 (Tenn 1993) | 1993 |
| Texas | 1984 | *Edgewood Independent School District v. Kirby*, 777 S.W.2d 391 (1989) | 1989 |
| Utah | 0 | | 0 |
| Vermont | 1995 | *Brigham v. State*, 166 Vt. 246, 692 A.2d 384 (1997) | 1997 |
| Virginia | 1991 | *Scott v. Commonwealth of Virginia*, 247 Va. 379, 443 S.E. 2d 138 (1994) | 0 |
| Washington | 2006 | *Federal Way School District v. State of Washington*, 06-2-86840-1 KNT, Superior Court of the State of Washington in and for the County of King (2006) | 2007 |
| West Virginia | 1995 | *Tomblin v. Gainer*, Civil Action No. 75-1268 (Cir. Ct. of Kenawha County, 1997) | 1997 |
| Wisconsin | 1989 | *Kukor v. Grover*, 148, Wis. 2d 469, 436 N.W.2d 568 (1989) | 0 |
| Wyoming | 1995 | *Campbell County Sch. Dist. v. State of Wyoming*, 907 P.2d 1238 (Wyo. 1995) ("Campbell I") | 1995 |

Additionally, for each state a series of data were collected from the Main NAEP Data Explorer from combinations of the following designations: grades four and eight; mathematics and reading; overall scale score; and scale score for students qualifying for the National School Lunch Program; African American students; Hispanic students; and White students. Once data from all years tested were included, the dataset included several hundred cases for each test.

The dataset was then moved to an SPSS file where several regression tests were run. Over time, this process offered insight into the extent to which the filing of a lawsuit or a successful challenge to a state's funding system impacted NAEP scores. It further provided awareness of how such impact varied among different subgroups of students.

**Sample Characteristics**

The NAEP scale scores represent the average scores for students on a given section of NAEP in the year the test was administered. In any given year, between 150,000 and 200,000 students are given various sections of the NAEP. The sample in this study is based on average scale scores of students in all fifty states in each year that the assessment was administered beginning in 1990 and ending with the most recent data in 2011. Scale scores were obtained for the following student groups in both fourth and eighth grade, and in the subjects of mathematics and reading: overall student performance; performance of students who qualify for free or reduced lunch as represented by National School Lunch Program eligibility; African American students; Hispanic students; and White students. The sample size depended on the number of times the NAEP was given for the different student groups over time.

The fourth grade mathematics NAEP was first administered in 1992 with results reported at the state level. It was then administered in 1996, 2000, 2003, 2005, 2007, 2009, and 2011. For fourth grade mathematics for students overall, n = 374. Beginning in 1996, data was disaggregated according to students' eligibility in the National School Lunch Program, which in this study, is used to obtain scale scores for students living in poverty. As a result, there are fewer data points for students in this subgroup than for students overall (n=333).

The first year the eighth grade mathematics NAEP was given to students was 1990. Subsequent administrations took place in 1992, 1996, 2000, 2003, 2005, 2007, 2009, and 2011. In each of these administrations, scale scores were reported for overall students (n= 407). As is the case with the fourth grade mathematics NAEP, National School Lunch Program eligibility information was not collected until 1996, so there are fewer data points for the subgroup of students living in poverty (n=329). The same trend holds true for the fourth and eighth grade reading assessments. The n count ranges from 247 for eighth grade Hispanic students in reading to 412 for fourth grade reading students overall. NAEP scale scores are different for each grade level and each content area assessment; therefore, scale scores cannot be compared across grades and disciplines (National Center for Education Statistics, 2012).

This study sought to build from the knowledge offered in previous studies and add to the overall picture concerning litigation and student achievement. The inclusion of the more current 2011 NAEP data provided an additional set of data points for each subgroup examined. The coding structure was designed to allow four years between the time of the latest lawsuit and the data collection. This increases the likelihood of

capturing achievement results and considers a research-based time frame for realizing change.

**Rationale for use of Multiple Regression**

In education, typically multiple variables are considered when analyzing relationships among different phenomena. Given the nature of the issues surrounding school finance litigation, it would be impossible to separate a single factor to examine the tangible effects of the court decisions on student performance. Lomax (2007) explained, "Given the complexity of most human, organizational, and animal behaviors, one predictor is usually not sufficient in terms of understanding the criterion" (p. 388). Considering school finance litigation, this statement makes inherent sense. Lomax indicated, "In order to account for a sufficient proportion of variability in the criterion, more than one predictor is necessary" (p. 388). Multiple regression allows for an analysis in which two or more predictors are used to predict the criterion variable (Lomax, 2007). In this study, year, suit filed, and plaintiff success functioned as the different predictors forecasting NAEP scale scores. This analysis provided a basis for exploring the research questions presented in this study.

**Summary**

The four sections in Chapter III offered an overview of the purpose of the study, a delineation of the procedures for collecting data and the methodology that will be utilized, a rationale for the methodology, and a summary of the chapter. More specifically, use of multiple regression in this study allowed for an analysis of overall student achievement and the achievement of focus groups of students, children from families living in poverty, and children who are racial minorities, in connection with

school finance litigation. This chapter has provided information regarding the design of the study, and Chapter IV will include a detailed analysis of the data.

Chapter IV

## Analysis of Data

The purpose of this study was to explore the extent to which adequacy litigation functions as a means for improving student achievement, particularly among low income and minority students. Data were gathered for this study from the National Assessment of Educational Progress (NAEP) from the National Center for Education Statistics website within the Main Data Explorer. Additional data collected includes information gleaned from court cases in each of the fifty United States as they relate to adequacy litigation.

The Main Data Explorer provides national and state results for each year the NAEP has been administered since 1990, in 10 subject areas, including mathematics, reading, writing, and science (National Center for Education Statistics, 2012). This study explored only data from mathematics and reading because they are the two subjects that have been emphasized the most in examining student achievement over time. Using an Excel spreadsheet, each state was listed, and adjacent to each state was a column for the coding value associated with filing a lawsuit, followed by a column with the coding value assigned to a plaintiff victory in an adequacy lawsuit. The first year listed was 1990, and the states were repeatedly listed in a vertical column each year beginning with 1990 and ending with 2011. The corresponding coding values were entered into the adjacent columns to correspond with each year listed.

Multiple court cases were examined to determine the appropriate coding under the categories, suit filed and plaintiff success. After researching the legal history of adequacy claims in each state, the year in which the first major adequacy lawsuit was

filed was noted. A four-year turnaround time was used to decide when coding should be used to indicate the filing of a lawsuit and a plaintiff victory based on the theory that change takes several years to realize. The study extended theory established in prior studies and considered the premise that change takes several years to realize, and that sufficient time to fully implement the court's decision and embark on a mission of reform may not have been possible with the two-year turnaround time provided for in past studies. Fullan (2000) asserted that school improvement surfaces in elementary schools in about two to three years. However, in high schools, a five- to six-year time frame is more likely to yield change. Meanwhile, districts, depending on size, can take six to eight years for large-scale reform efforts to take effect. Fullan further contended that due to a lack of research, it is unclear how long it would take entire states or countries to realize change as a result of large-scale reform. Measuring change beyond the initial investment takes years.

This study incorporated a four-year timeframe between the initial events, which in this case, included the filing of the adequacy case and a plaintiff victory and the point at which student achievement results were examined. Applying Fullan's (2000) time guidelines, four years should be sufficient to realize some gains using achievement scores from a sample of fourth and eighth grade students, given that school finance litigation and potential reform within states is considered a large-scale reform. While the successes may not be thoroughly institutionalized, there is likely to be some measure of improvement in a three- to five-year span of time (Fullan, 2000). Similarly, Hargreaves and Goodson (2006) differentiated between the initial gains on test scores that are often attributed to even the most tightly coordinated reform efforts and proceed

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The baseline year to begin the examination of adequacy claims was 1989 to correspond with the beginning of the third wave of cases that shifted from an equity focus to spotlight the issue of adequacy (Superfine, 2009). As a result, adequacy cases were analyzed across the fifty states beginning in 1989. There are a few exceptions to note. Thro (1994) characterized the third wave of school finance litigation as beginning with plaintiff victories in Montana, Kentucky, and Texas, and hinging on the argument that the quality of education is inadequate as compared with the education clauses in individual states' constitutions. In Kentucky's *Rose v. Council for Better Education* (1989), the Court determined that the entire system of funding schools was

unconstitutional. The court ordered the General Assembly to re-examine the state system and provide funding "sufficient to provide each child in Kentucky an adequate education" (p. 26). This case stems from an initial 1985 filing by 66 rural Kentucky districts. Even though the 1985 case precedes the 1989 baseline year, *Rose* is considered to be the fundamental basis for adequacy reform in Kentucky and served as a precedent for future cases in other states. As a result of its significance, this case was used as the initial adequacy filing and subsequent plaintiff victory in the state of Kentucky.

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In Texas, *Edgewood Independent School District v. Kirby* (1989) was originally filed in 1984 challenging the constitutionality of school funding in the state. In the landmark decision, the Supreme Court of Texas held that the existing formula violated the state constitutional provision requiring maintenance of an "efficient" system so as to achieve "general diffusion of knowledge" (p. 1). Like Kentucky, this case was filed prior to 1989 but has served as a fundamental basis for future school finance litigation in the state of Texas, concerning both equity and adequacy claims, and has also been signified by researchers as the beginning of the third wave of school finance cases.

*Edgewood* became the premise for the Robin Hood system in Texas, which serves as an equalization policy using a recapture clause to distribute funding across the school districts in the state.

Likewise, in Montana, *Helena Elementary Sch. Dist. No. 1 v. State* (1989) served as the monumental case for the state concerning school finance inequity and inefficiency. This case focused on the equality of educational opportunity that was afforded to students under the state's education clause. The Court overturned the state finance system citing failure of the state to provide such opportunity due to the financing scheme.

While Minnesota is not known for the precedent-setting landmark cases that would influence other states' decision-making, it serves as an exception to the 1989 baseline year for a different reason. In Minnesota, over fifty school districts and ten parents brought suit in 1988 claiming that unequal school funding created disparities in educational opportunity that violated the Minnesota Constitution (*Skeen v. State*, 1993). The ultimate decision was that through the use of a rational basis test, the school finance system was upheld. This case established the adequacy of the state's finance system and discouraged others from bringing suits on similar questions of adequacy.

Also worth noting, in Michigan, *Durant v. State* (1994) was filed and contained some components of adequacy questions. Unlike many of the other cases, this case was limited to specific areas, including the questions of whether or not special education and special education transportation state-mandated activities or services within the meaning of art, and whether or not the state should match payment for school lunches was part of the state-financed proportion for the purpose of computing compliance with

art. The limited scope of the questions and the fact that overall adequacy was not the issue in debate in this case resulted in assigning a coding value of 0 to Michigan in the category of suit filed.

In the previous chapter, Table 1 illustrated each of the fifty states, the date that a lawsuit was filed on adequacy grounds beginning in 1989, with the few exceptions noted above, and the year in which a plaintiff victory on adequacy claims occurred. Next to these two columns are the corresponding first years in which the state received a coding of 1. This coding was assigned four years after the suit was filed or the plaintiff victory occurred. Table 2, also presented in the previous chapter, provided a summary of the court cases that were examined and considered relevant in determining the coding of the variables.

Additionally, for each state a series of data were collected from the Main NAEP Data Explorer from combinations of the following designations: grades four and eight; mathematics and reading; overall scale score; and scale score for students qualifying for free and reduced lunch, African American students, Hispanic students, and White students. Once data from all years tested were included, the dataset included several hundred cases for each test.

The dataset was then moved to an SPSS file where several regression tests were run. Over time, this presented a glimpse at the extent to which the filing of a school funding lawsuit on adequacy grounds or a successful challenge to a state's funding system impacted NAEP scores. It further provided insight into the extent to which that impact varied among different subgroups of students.

**Sample Characteristics**

The NAEP scale scores represent the average scores for students on a given section of NAEP in the year the test was administered. In any given year, between 150,000 and 200,000 students are given various sections of the NAEP. The sample in this study is based on average scale scores of students in all fifty states in each year that the assessment was administered beginning in 1990 and ending with the most recent data in 2011. Scale scores were obtained for the following student groups in both fourth and eighth grades and in the subjects of mathematics and reading: overall student performance; performance of students who qualified for free or reduced lunch as determined by eligibility for the National School Lunch Program; African American students; Hispanic students; and White students. The sample size depended on the number of times the NAEP was given for the different student groups over time.

The fourth grade mathematics NAEP was first administered in 1992 with results reported at the state level. It was then administered in 1996, 2000, 2003, 2005, 2007, 2009, and 2011. For fourth grade mathematics students overall n = 374. Beginning in 1996, data was disaggregated according to students' eligibility in the National School Lunch Program, which, in this study, is used to obtain scale scores for students living in poverty. As a result, there are fewer data points for students in this subgroup than for students overall (n = 333). The first year the eighth grade mathematics NAEP was given to students was 1990. Subsequent administrations took place in 1992, 1996, 2000, 2003, 2005, 2007, 2009, and 2011. In each of these administrations, scale scores were reported for overall students (n = 407). As is the case with the fourth grade mathematics NAEP, National School Lunch Program eligibility information was not

collected until 1996, so there are fewer data points for the subgroup of students living in poverty (n = 329). The same trend holds true for the fourth and eighth grade reading assessments. The n count ranges from 247 for eighth grade Hispanic students in reading to 412 for fourth grade reading students overall. NAEP scale scores are different for each grade level and each content area assessment; therefore, scale scores cannot be compared across grades and disciplines (National Center for Education Statistics, 2012).

**Descriptive Statistics**

Table 3 presents descriptive statistics for the original variables for each of the aspects of student achievement, including fourth and eighth grade math and reading scale scores overall; fourth and eighth grade math and reading scale scores for students eligible for free and reduced lunch; fourth and eighth grade math and reading scale scores for African American students, Hispanic students, and White students, as well as measures of skewness and kurtosis. The mean scale scores range from 199.02 for fourth grade African American students in reading to 283.88 for White students in eighth grade mathematics; however, it is important to note that NAEP scales across subjects and grades are not consistent. According to the National Center for Education Statistics (2012):

> Because NAEP scales are developed independently for each subject, scale score and achievement-level results cannot be compared across subjects. However, these reporting metrics greatly facilitated performance comparisons within a subject from year to year and from one group of students to another in the same grade. (p. 1)

While comparing scale scores within a given grade level and subject reveal notable findings, generating comparisons using only scale scores across grades and subjects would be flawed. Examination of the descriptive statistics provided some insight when coupled with the regression analyses.

Standard error varied for each of the variables and ranged from .248 to .667. Scale scores for Hispanic students in eighth grade mathematics showed the greatest dispersion with a value of 58.2372, while the scale scores for all students in eighth grade reading display the least dispersion with a value of 26.831. The minimum score reported was 171.45 for fourth grade Hispanic students in reading, and the maximum score reported was 305 for White students in eighth grade mathematics. Preferred skewness and kurtosis values fall within the range of -2 to +2, and for all of the dependent variables, the values were in the acceptable range.

Table 3
*Descriptive Statistics*

| Variable | N | Range | Minimum | Maximum | Mean | | Std. Deviation | Variance | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| 4mathoverall | 374 | 51.5682 | 201.8283 | 253.3965 | 233.011545 | .5207793 | 10.0713914 | 101.433 | -.582 | .126 | -.275 | .252 |
| 4readoverall | 412 | 40.0116 | 196.7623 | 236.7739 | 218.088852 | .3539139 | 7.1836675 | 51.605 | -.485 | .120 | -.192 | .240 |
| 8mathoverall | 407 | 52.4118 | 246.4426 | 298.8543 | 276.113406 | .5084430 | 10.2574512 | 105.215 | -.457 | .121 | -.350 | .241 |
| 8readoverall | 327 | 26.8631 | 248.5054 | 275.3685 | 262.998932 | .3342055 | 6.0434856 | 36.524 | -.415 | .135 | -.671 | .269 |
| 4mathFR | 333 | 46.3019 | 194.3153 | 240.6172 | 222.939800 | .5215958 | 9.5182303 | 90.597 | -.733 | .134 | -.139 | .266 |
| 4readFR | 332 | 36.1405 | 182.3434 | 218.4839 | 205.156110 | .3673981 | 6.6943128 | 44.814 | -.578 | .134 | -.034 | .267 |
| 8mathFR | 329 | 43.7865 | 236.9342 | 280.7207 | 263.229987 | .4931109 | 8.9442223 | 79.999 | -.508 | .134 | -.243 | .268 |
| 8readFR | 327 | 27.9874 | 235.2840 | 263.2713 | 250.015054 | .3187616 | 5.7642115 | 33.226 | -.108 | .135 | -.693 | .269 |
| 4mathaa | 315 | 54.7307 | 181.7536 | 236.4843 | 213.931168 | .6655075 | 11.8115870 | 139.514 | -.555 | .137 | -.696 | .274 |
| 4readaa | 350 | 43.2274 | 176.4068 | 219.6342 | 199.023753 | .4326831 | 8.0947589 | 65.525 | -.112 | .130 | -.346 | .260 |
| 8mathaa | 321 | 50.6012 | 226.7099 | 277.3111 | 251.769894 | .6269905 | 11.2334577 | 126.191 | -.119 | .136 | -.767 | .271 |
| 8readaa | 266 | 29.7916 | 231.2556 | 261.0472 | 244.695088 | .3373548 | 5.5020906 | 30.273 | -.056 | .149 | -.333 | .298 |
| 4mathhis | 286 | 58.3183 | 186.4152 | 244.7335 | 222.233274 | .6677704 | 11.2930223 | 127.532 | -.799 | .144 | -.029 | .287 |
| 4readhis | 309 | 54.8187 | 171.4472 | 226.2658 | 203.523685 | .4968190 | 8.7332808 | 76.270 | -.448 | .139 | .879 | .276 |
| 8mathhis | 274 | 58.2372 | 226.8570 | 285.0942 | 261.141075 | .6283092 | 10.4003680 | 108.168 | -.581 | .147 | .150 | .293 |
| 8readhis | 247 | 34.6296 | 233.3563 | 267.9859 | 249.343051 | .4070998 | 6.3980755 | 40.935 | .209 | .155 | -.214 | .309 |
| 4mathwhit | 374 | 42.5968 | 215.6160 | 258.2127 | 239.855895 | .4922123 | 9.5189323 | 90.610 | -.476 | .126 | -.721 | .252 |
| 4readwhit | 412 | 31.3020 | 211.6994 | 243.0014 | 225.693978 | .2705386 | 5.4913344 | 30.155 | .209 | .120 | .279 | .240 |
| 8mathwhit | 406 | 48.6093 | 256.3899 | 304.9992 | 283.877019 | .4655362 | 9.3802951 | 87.990 | -.385 | .121 | -.185 | .242 |
| 8readwhit | 327 | 28.9318 | 255.0207 | 283.9525 | 269.699574 | .2484891 | 4.4934633 | 20.191 | -.091 | .135 | .796 | .269 |

## Research Questions

The research questions naturally fall into three groups. Questions 1 and 2 are concerned with the overall student achievement as measured by scale scores on NAEP. The first question focused on the relationship between overall scale scores representing student achievement, and the filing of an adequacy lawsuit. Similarly, the second question also dealt with overall scale scores representing student achievement; however, the independent variable is the plaintiff victory in an adequacy lawsuit. Because the two questions focused on overall student achievement, findings related to the first and second questions are discussed collectively.

### Research Questions 1 and 2:

Research question 1 asked, "Is there a statistically significant relationship between overall student achievement in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?" Question 2 asked, "Is there a statistically significant relationship between overall student achievement in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had a plaintiff victory in an adequacy lawsuit?" Table 4 provides a summary of the unstandardized partial regression coefficients for each model when examining scale scores for students overall. Statistically significant results at the .05 Type I error rate are denoted with *.

Table 4
*Results by Variable for Students Overall*

| Variable | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| Year | 1.216* | .241* | .820* | .155 |
| Suit Filed | 2.271* | 3.065* | 3.528* | 3.552* |
| Plaintiff Success | .148 | .367 | -.592 | -.053 |
| Constant | 214.039 | 212.654 | 263.317 | 257.780 |

Table 5 provides a snapshot of the R-Square, R, and Adjusted R-Square values in each model for students overall.

Table 5
*Model results for Students Overall*

| | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| R-Square | .616 | .134 | .421 | .083 |
| R | .785 | .366 | .649 | .288 |
| Adjusted R-Square | .613 | .128 | .416 | .074 |

Regression coefficients are used to isolate which predictors are accounting for significant variation to the criterion variable, which in this case is overall student achievement in fourth grade math. The unstandardized partial regression coefficients have the influence of the remaining predictors partialled out or controlled for the remaining predictors. When looking at the model for fourth grade math, the unstandardized partial regression coefficients included in the prediction equation are as follows:

$$\hat{y} = 1.216X_1 + .2.271X_2 + .148X_3 + 214.039$$

The unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase of 2.271 points in student achievement for

overall students in fourth grade mathematics. This predicted increase was statistically significant ($p = .008$ as compared with $\alpha = .05$). There was also an increase of an additional .148 points if the plaintiff had success. This is on top of the expected gain of 1.216 points for every year beyond the initial year within the data set and was statistically significant ($p < .00$). The constant of 214.039 was the starting point for these values. In summary, all variables except for plaintiff success showed significance at .05.

The R-square value is the coefficient of determination and expresses the proportion of variance in fourth grade math overall scale scores explained by the set of predictor variables (year, suit filed, and plaintiff success). The R value is the multiple correlations between the set of predictors and overall scale scores in fourth grade math. The R-square value was .616, the R value was .785, so these variables (year, suit filed, and plaintiff success) accounted for about 62% of the variance in student achievement in math for fourth grade students overall. The test of the population R-square value was statistically significant at $p < .01$, meaning that the set of predictors was accounting for a statistically significant variation in the fourth grade scale scores for fourth grade students overall. According to Cohen (1998), this is a large effect size. The adjusted R-square was .613. This number brings the sample R-square value more in line with the population R-square value. It adjusts for how many predictors there are in the model. In this case, Adjusted R-square showed that 61% of the variance in the overall scale scores in fourth grade mathematics was explained by the set of predictor variables. It is important to analyze both R-square and Adjusted R-square because the difference between the two shows shrinkage and allows for the visualization of both the sample R-

square value and a value that represents a closer representation of the overall population R-square value since the Adjusted R-square takes sample size and the number of predictors into account. The model overall was significant ($p < .01$).

In examining fourth grade reading, some similar trends were observed, but some notable differences were also apparent. When looking at the model for fourth grade reading, the unstandardized partial regression coefficients included in the prediction equation were as follows:

$$\hat{y} = .241X_1 + .3.065X_2 + .367X_3 + 212.654$$

The unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase of 3.065 points in student achievement for overall students in fourth grade reading. This predicted increase was statistically significant (.001). There was also an increase of an additional .367 points if the plaintiff had success, which was not significant. This is on top of the expected gain of .241 points for every year beyond the initial year within the data set, which was statistically significant ($p < .001$, as compared with $\alpha=.05$). In summary, all variables except plaintiff success showed significance at .05.

The R-square value was .134, the R value was .366, and Adjusted R-square was .128. Consequently, these variables (year, suit filed, and plaintiff success) accounted for about 36% of the variance in student achievement in reading for fourth grade students overall. According to Cohen (1998), this is a medium effect size. In this case, Adjusted R-square showed that 12.8% of the variance in the overall scale scores in

fourth grade reading was explained by the set of predictor variables. The model overall was significant ($p < .01$).

When comparing the results for fourth grade mathematics and reading, the variables, suit filed and year, were significant in both models. Likewise, the entire model was significant overall; however, there was a large effect size in mathematics and a medium effect size in reading. In both models, the variable, plaintiff success, was not statistically significant in terms of predicting scale scores in fourth grade reading or math.

The models run for eighth grade also revealed some similarities. The unstandardized partial regression coefficients included in the prediction equation for eighth grade mathematics were as follows:

$$\hat{y} = .820X_1 + .3.528X_2 - .592X_3 + 262.317$$

In this case, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase of 3.528 points in student achievement for overall students in eighth grade mathematics. This predicted increase was statistically significant ($p = .001$, as compared with $\alpha = .05$). There was also a decrease of .592 points if the plaintiff had success, which was not significant. For every year beyond the initial year within the data set, there was a predicted gain of .820, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). In summary, all variables except for plaintiff success showed significance at $\alpha = .05$, which is similar to the results seen in examining the variables in fourth grade mathematics and reading.

The R-square value was .421, the R value was .649, and Adjusted R-square was .416. Because R-square was .421, this meant that 42% of the variance in the scale scores for eighth grade mathematics overall could be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlations between the set of predictors and the overall scale scores in eighth grade math. According to Cohen (1998), this is a large effect size. In this case, Adjusted R-square showed that 41.6% of the variance in the overall scale scores in eighth grade mathematics was explained by the set of predictor variables The model overall was significant ($p < .01$).

An examination of the model run for eighth grade reading reveals the unstandardized partial regression coefficients included in the prediction equation were as follows:

$$\hat{y} = .155X_1 + .3.552X_2 - .053X_3 + 257.780$$

In this case, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase of 3.552 points in student achievement for overall students in eighth grade reading. This predicted increase was statistically significant ($p < .001$, as compared with $\alpha = .05$). There was also a decrease of .053 points if the plaintiffs were successful, but this amount was not statistically significant ($p = .943$). For every year beyond the initial year within the data set, there was a predicted gain of .155, which was not statistically significant ($p = -.065$). In summary, the only variable which was statistically significant at $\alpha = .05$, was the filing of a lawsuit. This variable was significant for students overall in reading and in mathematics in both fourth and eighth grades. Eighth grade reading was the only grade

and subject in which the year was not a significant predictor of the scale score for students overall.

In looking at the eighth grade reading model overall, the R-square value was .083, the R value was .288, and Adjusted R-square was .074. Because R-square was .083, this meant that only 8.3% of the variance in the scale scores for eighth grade reading overall could be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlations between the set of predictors and overall scale scores in eighth grade reading. According to Cohen (1998), this is a small effect size. In this case, Adjusted R-square illustrated that 7.4% of the variance in the overall scale scores in eighth grade reading was explained by the set of predictor variables. The model overall was significant ($p < .01$).

Multicollinearity refers to situations where measured variables are so highly correlated that they are essentially measuring the same thing. Looking at the tolerance, the values ranged from .586 in eighth grade mathematics for the variable, suit filed, to .949 for the variable, year, in eighth grade reading. None of the tolerance values were close to .10, so there was not an indication from this standpoint of multicollinearity. In examining the Variance Inflation Factor (VIF), values greater than 10 suggest problems with multicollinearity. VIF values ranged from 1.053 for year in eighth grade reading to 1.708 for suit filed in the eighth grade mathematics model, suggesting there was no evidence of a problem with multicollinearity.

In summary, when examining the results relative to research questions 1 and 2, the filing of a lawsuit was significant for both fourth and eighth grade in reading and in mathematics as evidenced by NAEP scale scores for students overall. Time was

significant in fourth grade mathematics and reading and in eighth grade mathematics. The variable, plaintiff success, was not statistically significant for students overall in either of the grade levels or subject areas.

**Research Questions 3 and 4:**

Research question 3 asked, "Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states in which an adequacy lawsuit has been filed?" Similarly, question 4 asked, "Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?"

Table 6 illustrates a summary of the unstandardized partial regression coefficients for each model when examining scale scores for students who qualified for free and reduced lunch, which is the term used to describe students living in poverty. Significant values are denoted with *.

Table 6
*Results by Variable for Students Participating in National School Lunch Program*

| Variable | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| Year | 1.547* | .571* | 1.107* | .340* |
| Suit Filed | .869 | 1.092 | 1.686 | 2.009* |
| Plaintiff Success | .725 | 1.007 | -.297 | -.159 |
| Constant | 197.709 | 194.644 | 244.577 | 242.972 |

Table 7 illustrates the R-Square, R, and Adjusted R-Square values in each model for students qualifying for Free/Reduced Lunch.

Table 7
*Model Results for Students Participating in School Lunch Program*

| | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| R-Square | .633 | .150 | .370 | .089 |
| R | .796 | .387 | .608 | .297 |
| Adjusted R-Square | .630 | .142 | .364 | .080 |

In contrast from the overall model in fourth grade mathematics, the model for fourth grade students participating in the national school lunch program revealed some distinct differences. When looking at the model for fourth grade mathematics, the unstandardized partial regression coefficients included in the prediction equation were as follows:

$$\hat{y} = 1.547X_1 + .869X_2 + .725X_3 + 197.709$$

In this case, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase of .869 points in fourth grade mathematics in student achievement for students living in poverty. This predicted increase was not statistically significant ($p = .293$, which is greater than $\alpha = .05$). There was also a predicted scale score increase of .725 points if the plaintiff had success, but this amount was not statistically significant, as $p = .335$, which is greater than $\alpha = .05$. For every year beyond the initial year within the data set, there was a predicted gain of 1.547, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). In summary, only the variable, year, was statistically significant at $\alpha = .05$. Consequently, scale scores in fourth grade mathematics for students living in poverty have been

increasing over time and were not predicted by either the filing of an adequacy lawsuit or a successful plaintiff victory in an adequacy lawsuit.

In looking at the fourth grade mathematics model for students living in poverty, the R-square value was .633, the R value was .796, and the Adjusted R-square was .630. With R-square of .633, 63.3% of the variance in the scale scores of students living in poverty for fourth grade mathematics can be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlations between the set of predictors and scale scores in fourth grade mathematics for students living in poverty. According to Cohen (1998), this is a large effect size. When looking at the model for fourth grade students living in poverty, Adjusted R-square showed that 63% of the variance in the overall scale scores in fourth grade mathematics was explained by the set of predictor variables. The model overall was significant ($p < .01$).

The results from the model representing fourth grade reading for students living in poverty were closely aligned with those from the mathematics model for fourth grade students living in poverty. When looking at the results of the regression model in reading for fourth grade students living in poverty, the unstandardized partial regression coefficients included in the prediction equation were as follows:

$$\hat{y} = .571X_1 + 1.092X_2 + 1.007X_3 + 194.644$$

In this case, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase in fourth grade reading of 1.092 points in student achievement for students living in poverty. This predicted increase was not statistically significant ($p = .223$, as compared with $\alpha = .05$). There was also an increase of 1.007 points if the plaintiff had success in the adequacy case,

but this amount was also not statistically significant, ($p = .201$, which is greater than $\alpha = .05$). For every year beyond the initial year within the data set, there was a predicted gain of .571, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). In summary, the only variable which was statistically significant at $\alpha = .05$ was the year for fourth grade reading students living in poverty.

In looking at the fourth grade reading model for students living in poverty, the R-square value was .150, the R value was .387 and the Adjusted R-square was .142. As R-square was .150, 15% of the variance in the scale scores for students living in poverty for fourth grade reading can be explained by the set of predictor variables, year, suit filed, plaintiff success. The R value is the multiple correlation between the set of predictors and scale scores in fourth grade reading for students living in poverty. According to Cohen (1998), this is a medium effect size. In this case, Adjusted R-square showed that 14.2% of the variance in the scale scores in fourth grade reading for students living in poverty can be explained by the set of predictor variables. The model overall was significant ($p < .01$).

Similar trends are seen in examining the model for eighth grade mathematics. The prediction equation was:

$$\hat{y} = 1.107X_1 + 1.686X_2 - .297X_3 + 244.577$$

In states in which an adequacy lawsuit was filed, there was a predictive increase in student achievement for students living in poverty in eighth grade mathematics of 1.686 points. This predicted increase was not statistically significant ($p = .1$, which is greater than $\alpha = .05$). There was also a predicted scale score decrease of .297 points if the plaintiff had success, but this amount was not statistically significant ($p = .749$,

which is greater than α = .05). For every year beyond the initial year within the data set, there was a predicted gain of 1.107, which was statistically significant ($p < .001$, as compared with α = .05). In summary, year was the only variable which was statistically significant at α = .05, denoting scale scores in eighth grade mathematics for students living in poverty have been increasing over time and were not predicted by either the filing of an adequacy lawsuit or a successful plaintiff victory in an adequacy lawsuit.

In looking at the eighth grade mathematics model for students living in poverty, the R-square value was .370, demonstrating that 37% of the variance in the scale scores of students living in poverty for eighth grade mathematics could be explained by the set of predictor variables, year, suit filed, plaintiff success. The R value was .608 and the Adjusted R-square was .364. The R value was the multiple correlation between the set of predictors and scale scores in eighth grade mathematics for students living in poverty. According to Cohen (1998), this combination of the R-Square value and the R value is a large effect size. When looking at the model for eighth grade students living in poverty, Adjusted R-square showed that 36.4% of the variance in the scale scores for students living in poverty in eighth grade mathematics was explained by the set of predictor variables. The model overall was significant ($p < .01$).

The eighth grade reading results for students living in poverty show one main difference in that both variables, year and suit filed, revealed significance. The prediction equation was:

$$\hat{y} = .340X_1 + 2.009X_2 - .159X_3 + 242.972$$

In states in which an adequacy lawsuit was filed, there was a predictive increase in student achievement in eighth grade reading of 2.009 points for students living in

poverty. This predicted increase was statistically significant ($p = .013$, which is less than $\alpha = .05$). There was also a predicted scale score decrease of .159 points if the plaintiff had success, but this amount was not statistically significant ($p = .821$, which is greater than $\alpha = .05$). For every year beyond the initial year within the data set, there was a predicted gain of .340, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). In summary, both variables, year and suit filed, were statistically significant at $\alpha = .05$, meaning scale scores in eighth grade reading for students living in poverty have been increasing over time and were predicted by the filing of an adequacy lawsuit but not by a successful plaintiff victory in an adequacy lawsuit.

In looking at the eighth grade reading model for students living in poverty, the R-square value was .089, demonstrating that 8.9% of the variance in the scale scores of students living in poverty for eighth grade reading can be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value was .297, and the Adjusted R-square was .080. The R value is the multiple correlation between the set of predictors and scale scores in eighth grade reading for students living in poverty. According to Cohen (1998), this combination of the R-Square value and the R value is a small effect size. When looking at the model for eighth grade reading students living in poverty, the Adjusted R-square illustrated that 8% of the variance in the scale scores for students living in poverty in eighth grade reading was explained by the set of predictor variables. The model overall was significant ($p < .01$).

**Research Questions 5 and 6:**

Research question 5 asked, "Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by

scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?" Question 6 posed, "Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?" Table 8 includes a summary of the unstandardized partial regression coefficients for each model when examining scale scores for African American students, while Table 9 includes the same information for Hispanic students. Significant values are denoted with *.

Table 8
*Results by Variable for African American Students*

| Variable | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| Year | 1.671* | .745* | 1.262* | .442* |
| Suit Filed | -.737 | -1.518 | -.697 | -1.016 |
| Plaintiff Success | 2.160* | 2.770* | 1.860 | 1.114 |
| Constant | 189.521 | 188.713 | 234.630 | 237.783 |

Table 9
*Model Results for Hispanic Students*

| Variable | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| Year | 1.581* | .707* | 1.202* | .473* |
| Suit Filed | .580 | .286 | .210 | 2.187* |
| Plaintiff Success | 2.957* | 2.674* | 2.466* | 1.062 |
| Constant | 196.210 | 191.729 | 242.035 | 239.334 |

Table 10 reveals the model results for African American students, while Table 11 illustrates the same information for Hispanic students. There are some similar trends

in comparing across student groups. Effect sizes were larger for mathematics in both fourth and eighth grade than in reading for African American and Hispanic students.

Table 10
*Model Results for African American Students*

| | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| R-Square | .750 | .343 | .622 | .113 |
| R | .866 | .585 | .789 | .336 |
| Adjusted R-Square | .747 | .337 | .618 | .103 |

Table 11
*Model Results for Hispanic Students*

| | Fourth Grade Mathematics | Fourth Grade Reading | Eighth Grade Mathematics | Eighth Grade Reading |
|---|---|---|---|---|
| R-Square | .688 | .271 | .591 | .154 |
| R | .829 | .520 | .769 | .393 |
| Adjusted R-Square | .685 | .263 | .587 | .144 |

Considering the performance of African American students in fourth grade mathematics, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive decrease in student achievement of .737 points. This predicted decrease was not statistically significant ($p = .398$). There was also an increase of 2.160 points if the plaintiff had success in the adequacy case, and this increase was statistically significant ($p = .010$). For every year beyond the initial year within the data set, there was a predicted gain of 1.671, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). For fourth grade African American students, both the year and the plaintiff's success variables were statistically significant at $\alpha = .05$, in predicting increases in student achievement in mathematics. The results

were observed in the prediction equation for the fourth grade mathematics model for African American students:

$$\hat{y} = 1.671X_1 - .737X_2 + 2.160X_3 + 189.521$$

The R-square value was .750 and Adjusted R-square was .747, so these variables (year, suit filed, and plaintiff success) accounted for about 75% of the variance in student achievement in math for African American fourth grade students. The model overall was significant ($p < .01$).

A similar pattern was observed for fourth grade African American students in reading, although the R-square value of .343 and the Adjusted R-square value of .337 were smaller, the variables only accounted for about 34% of the variance in reading achievement indicators for African American students. The model overall was significant ($p < .01$). The prediction equation for the fourth grade reading model for African American students was:

$$\hat{y} = .745X_1 - 1.518X_2 + 2.770X_3 + 188.713$$

The equation revealed that in states in which a lawsuit was filed, there was a predictive decrease in student achievement of .1.518 points. This predicted decrease was not statistically significant, ($p = .101$, as compared with $\alpha = .05$). There was, however, a predicted increase of 2.770 points if the plaintiff had success in the adequacy case and this increase was statistically significant ($p = .002$ which is greater than $\alpha = .05$). For every year beyond the initial year within the data set, there was a predicted gain of .745, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). For fourth grade African American students, both the year and the plaintiff's

success variables were statistically significant at α = .05, in predicting student achievement increases in reading and in mathematics.

Statistical significance was also observed with the variable, year, in eighth grade mathematics, but not with the other two variables. The prediction equation for African American students in eighth grade mathematics was:

$$\hat{y} = 1.262X_1 - .697X_2 + 1.860X_3 + 234.630$$

In states in which a lawsuit was filed, there was a predictive decrease in student achievement of .697 points. This predicted decrease was not statistically significant (p =.503, as compared with α = .05). There was a predicted increase of 1.860 points if the plaintiff had success in the adequacy case, but this increase was not statistically significant (p = .061, which is greater than α = .05). For every year beyond the initial year within the data set, there was a predicted gain of 1.262, which was statistically significant (p < .001, as compared with α=.05). For eighth grade African American students, only the year variable was statistically significant at α=.05, in predicting increases in student achievement in mathematics.

Similarly, for eighth grade African American students in reading, the only variable revealed as a significant predictor of student achievement based on NAEP scale scores was year. The prediction equation was:

$$\hat{y} = .442X_1 - 1.016X_2 + 11.114X_3 + 237.783$$

In states in which a lawsuit was filed, there was a predictive decrease in student achievement of 1.016 points. This predicted decrease was not statistically significant (p = .228, as compared with α = .05). There was a predicted increase of 1.114 points if the plaintiff had success in the adequacy case, but this increase was not statistically

significant ($p = .131$, which is greater than $\alpha = .05$). For every year beyond the initial year within the data set, there was a predicted gain of .442, which was statistically significant ($p < .001$, as compared with $\alpha = .05$). For eighth grade African American students, only the variable, year, was statistically significant at $\alpha = .05$ in predicting increases in student achievement in both mathematics and reading.

In considering the percentage of variance in student achievement accounted for by the three dependent variables in eighth grade mathematics and reading, differences between the two content areas were observed. In mathematics, the R-square value was .622 and the Adjusted R-square was .618, so the variables, year, suit filed, and plaintiff victory, accounted for about 62% of the variance in student achievement in math for African American eighth grade students. In reading, the R-square value was .113 and Adjusted R-square was .103, so the variables, year, suit filed, and plaintiff success, accounted for only about 11% of the variance in student achievement in reading for African American eighth grade students. The models overall were both significant ($p < .01$).

When examining the prediction equation corresponding to the fourth grade mathematics model for Hispanic students, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase in student achievement for Hispanic students in fourth grade mathematics of .580 points. This predicted increase was not statistically significant, as $p = .562$ which is greater than $\alpha = .05$. In contrast, there was a predicted scale score increase of 2.957 points if the plaintiff had success; this amount was statistically significant as $p = .001$, which is less than $\alpha = .05$. For every year beyond the initial year within the data set, there was a

predicted gain of 1.581, which was statistically significant ($p < .001$, as compared with $\alpha = .05$).

In summary, the variables that showed statistical significance at $\alpha = .05$, were the year and plaintiff success. This means that scale scores in fourth grade mathematics for Hispanic students have been increasing over time and were also predicted to increase with a successful plaintiff victory in an adequacy lawsuit. The prediction equation revealing these values was:

$$\hat{y} = 1.581X_1 + .580X_2 + 2.957X_3 + 196.210$$

In examining the fourth grade mathematics model for Hispanic students, the R-square value was .688, the R value was .829, and the Adjusted R-square was .685. With R-square of .688, 68.8% of the variance in the scale scores of Hispanic students for fourth grade mathematics can be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlation between the set of predictors and scale scores in fourth grade mathematics for Hispanic students. According to Cohen (1998), this is a large effect size. According to the fourth grade Hispanic students in mathematics, the Adjusted R-square illustrated that 68.5% of the variance in the scale scores in fourth grade mathematics was explained by the set of predictor variables. The model overall was significant ($p < .01$).

In observing the prediction equation for the fourth grade reading model for Hispanic students is, the unstandardized coefficient equation shows that in states in which a lawsuit was filed, there was a predictive increase in student achievement for Hispanic students in fourth grade mathematics of .286 points. This predicted increase was not statistically significant ($p = .797$, which is greater than $\alpha = .05$). In contrast,

there was a predicted scale score increase of 2.674 points if the plaintiff had success, and this amount was statistically significant ($p = .011$, which is less than $\alpha = .05$). For every year beyond the initial year within the data set, there was a predicted gain of .707, which was statistically significant ($p < .001$, as compared with $\alpha = .05$).

In summary, the variables that showed statistical significance at $\alpha = .05$, were year and plaintiff success. Consequently, scale scores in fourth grade reading for Hispanic students have been increasing over time and were also predicted to increase with a successful plaintiff victory in an adequacy lawsuit. The prediction equation demonstrating these values was:

$$\hat{y} = .707X_1 + .286X_2 + 2.674X_3 + 191.729$$

In analyzing the fourth grade reading model for Hispanic students, the R-square value was .271, the R value was .520, and the Adjusted R-square was .263. With R-square of .271, only 27% of the variance in the scale scores of Hispanic students for fourth grade reading can be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlation between the set of predictors and scale scores in fourth grade reading for students living in poverty. According to Cohen (1998), this is a medium effect size. When looking at the model for fourth grade Hispanic students in reading, the Adjusted R-square showed that 26.3% of the variance in the scale scores in fourth grade reading was explained by the set of predictor variables. The model overall was significant ($p < .01$).

Interpretation of the eighth grade mathematics model for Hispanic students revealed that in states in which a lawsuit was filed, there was a predictive increase in student achievement of .210 points for Hispanic students in eighth grade mathematics.

This predicted increase was not statistically significant (p = .843, which is greater than α = .05). In contrast, there was a predicted scale score increase of 2.466 points if the plaintiff had success, and this amount was statistically significant (p = .014, which is less than α = .05). For every year beyond the initial year within the data set, there was a predicted gain of 1.202, which was statistically significant (p < .001, as compared with α = .05). The constant of 242.035 was the starting point for these values.

In summary, the variables that showed statistical significance at α = .05 were the year and plaintiff success. This means that scale scores in eighth grade mathematics for Hispanic students are increasing over time and are also predicted to increase with a successful plaintiff victory in an adequacy lawsuit. The following prediction equation for the eighth grade mathematics model for Hispanic students illustrates the values explained above:

$$\hat{y} = 1.202X_1 + .210X_2 + 2.466X_3 + 242.035$$

In looking at the eighth grade mathematics model for Hispanic students, the R-square value was .591, the R value was .769, and the Adjusted R-square was .587. With R-square of .591, about 59% of the variance in the scale scores of Hispanic students for eighth grade mathematics can be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlation between the set of predictors and scale scores in eighth grade mathematics for Hispanic students. According to Cohen (1998), this is a large effect size. When looking at the model for eighth grade Hispanic students in mathematics, the Adjusted R-square showed that 58.7% of the variance in the scale scores in eighth grade mathematics was explained by the set of predictor variables. The model overall was significant (p < .01).

The prediction equation for the eighth grade reading model for Hispanic students reveals that in states in which a lawsuit was filed, there was a predictive increase of 2.187 points in student achievement for Hispanic students in eighth grade reading. This predicted increase was statistically significant ($p = .026$, which is less than $\alpha = .05$). There was also a predicted scale score increase of 1.062 points if the plaintiff had success, and in contrast to the previous results for Hispanic students, this amount was not statistically significant ($p = .231$, which is greater than $\alpha = .05$). For every year beyond the initial year within the data set, there was a predicted gain of .473, which was statistically significant ($p < .001$, as compared with $\alpha = .05$).

In summary, the variables that showed statistical significance at $\alpha = .05$ were time and the filing of an adequacy suit. This means that scale scores in eighth grade reading for Hispanic students are increasing over time and are also predicted to increase with the filing of an adequacy lawsuit. The results are visible in the prediction equation:

$$\hat{y} = .473X_1 + 2.187X_2 + 1.062X_3 + 239.334$$

In looking at the eighth grade reading model for Hispanic students, the R-square value was .154, the R value was .393, and the Adjusted R-square was .144. With R-square of .154, only about 15% of the variance in the scale scores of Hispanic students for eighth grade reading can be explained by the set of predictor variables, year, suit filed, and plaintiff success. The R value is the multiple correlation between the set of predictors and scale scores in eighth grade reading for Hispanic students. According to Cohen (1998), this is a medium effect size. When looking at the model for eighth grade Hispanic students in reading, the Adjusted R-square illustrated that 14.4% of the

variance in the scale scores in eighth grade reading was explained by the set of predictor variables. The model overall was significant ($p < .01$).

**Summary**

This chapter described the data collected for the study and the statistical procedures used to answer the research questions presented in the study. Three variables, year, suit filed, and plaintiff success, were examined in relation to student achievement as defined by scale scores on the National Assessment of Educational Progress, or NAEP. Scores were analyzed for fourth and eighth grade students overall in mathematics and reading, students living in poverty as defined by National School Lunch Program eligibility, African American students, and Hispanic students. The Year emerged as significant for all regression models with the exception of eighth grade reading overall scale scores. The variable, lawsuit filed, was significant in the following models: overall student scale scores in fourth and eighth grade mathematics and reading, eighth grade reading for students living in poverty, and eighth grade Hispanic students in reading. The variable, plaintiff success, was significant for fourth grade African American students in both mathematics and reading, fourth grade Hispanic students in both mathematics and reading, and eighth grade Hispanic students in mathematics.

These results provide a comprehensive picture of the relationship between the filing of and adequacy lawsuit, the successfulness of such a lawsuit, and student achievement as defined by scale scores on NAEP. They also provide some insight into which student groups actually benefit from school finance litigation on adequacy

grounds. The following chapter provides the findings, conclusions, and implications gleaned from this analysis.

Chapter V

## Findings, Conclusions, and Recommendations

This chapter includes an overview of the study, a discussion of findings and relevant literature, as well as a review of the research questions, followed by connections to the results provided in the previous chapter. Conclusions are based on these findings and conveyed in this chapter, followed by recommendations for future research and policy change. The concluding summary encapsulates this chapter and the entire study.

The purpose of this study was to explore the relationship between adequacy litigation and student achievement. Through dissecting adequacy litigation in each of the fifty states, this study examined the impact on student achievement as shown by scale scores in reading and mathematics on the National Assessment of Educational Progress (NAEP).

A review of the literature reveals a shift in approach in school finance litigation historically. Many researchers recognize three waves of litigation (Rebell, 1998). The first two waves concentrated on equity and relied on the U.S. Equal Protection Clause, which declares education is a right that must be provided equally to all students and that the government cannot discriminate among students on the basis of wealth and state's equal protection clauses, respectively (Superfine, 2009). The basic premise in the first two waves was that more money translated into a better education (Thro, 1994). Encountering little success in court, plaintiffs in the third wave shifted the focus to adequacy rather than equity. Arguments shifted focus and "plaintiffs argued state education clauses require states to devote sufficient levels of funds to enable students to

receive adequate educations" (Superfine, 2009, p. 488). Thro (1994) differentiated, "In these suits, the emphasis has been on differences in equality of education delivered, rather than on the resources available to the districts" (p. 603).

In light of the transformation in school finance litigation over time, the question remains as to what relationship exists between the more recent approach of adequacy arguments in court and actual student academic gains. Verstegen (1993) concluded that court-ordered reform produced positive impacts, some of which included improved curricula, funds for teacher incentives, and additional use of achievement testing. Similarly, Downes and Figlio (1998) found, "Court-mandated and legislatively mandated school finance reforms have led, on average, to increased student performance" (p. 34). Glenn (2006) used the National Assessment of Educational Progress (NAEP) to examine the impact of adequacy litigation and determined a positive relationship between a successful adequacy lawsuit and NAEP scores for both the entire sample of students and African American students. This study revealed a positive relationship between adequacy litigation and student achievement in several instances and considered time as a factor in implementing the subsequent changes resulting from both the filing of an adequacy suit and a plaintiff's success in an adequacy lawsuit. The following research questions guided the study:

1. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states in which an adequacy lawsuit has been filed?

2. Is there a statistically significant relationship between overall student achievement in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states that have had a plaintiff victory in an adequacy lawsuit?

3. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states in which an adequacy lawsuit has been filed?

4. Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states that have had plaintiff victory in an adequacy lawsuit?

5. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states in which an adequacy lawsuit has been filed?

6. Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational

Progress (NAEP) and in states that have had plaintiff victory in an adequacy lawsuit?

Regression analyses were run using fourth and eighth grade NAEP scale scores in reading and mathematics for different student groups with the independent variables year, suit filed, and plaintiff success. Over time, this provided a look at the extent to which the filing of a lawsuit or a successful adequacy-based challenge to a state's funding system impacted NAEP scores. It also gave insight to the extent to which that impact varied among different subgroups of students.

**Findings**

The year emerged as significant for all regression models with the exception of eighth grade reading overall scale scores. The variable, lawsuit filed, was significant in the following models: overall student scale scores in fourth and eighth grade mathematics and reading, eighth grade reading for students living in poverty, and eighth grade Hispanic students in reading. The variable, plaintiff success, was significant for fourth grade African American students in both mathematics and reading, fourth grade Hispanic students in both mathematics and reading, and eighth grade Hispanic students in mathematics. Table 12 summarizes these results:

Table 12
*Summary of Results*

| | Year | Suit Filed | Plaintiff Success |
|---|---|---|---|
| fourth grade mathematics overall | significant | significant | |
| fourth grade reading overall | significant | significant | |
| eighth grade mathematics overall | significant | significant | |
| eighth grade reading overall | | significant | |
| fourth grade mathematics poverty | significant | | |
| fourth grade reading poverty | significant | | |
| eighth grade mathematics poverty | significant | | |
| eighth grade reading poverty | significant | significant | |
| fourth grade mathematics African American | significant | | significant |
| fourth grade reading African American | significant | | significant |
| eighth grade mathematics African American | significant | | |
| eighth grade reading African American | significant | | |
| fourth grade mathematics Hispanic | significant | | significant |
| fourth grade reading Hispanic | significant | | significant |
| eighth grade mathematics Hispanic | significant | | significant |
| eighth grade reading Hispanic | significant | significant | |

Research question 1 asked, "Is there a statistically significant relationship between overall student achievement in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?" The results from the regression analysis illustrate that there was a significant relationship for all four groups considered using the overall scale scores. In both reading and mathematics, the relationship between the scale scores for both fourth and eighth graders and whether or not the state had experienced the filing of an adequacy lawsuit was significant. With scores increasing nationally as a function of time, the filing of a lawsuit increases this impact in fourth and eighth grade reading and mathematics. This finding is consistent with Downes and Figlio (1998), who asserted that on average student performance increased with court-mandated reforms. Similarly, Verstegen (1993) also concluded that court-ordered reform produced positive impacts.

Intuitively, the finding makes sense. When a lawsuit is filed in a state challenging the adequacy of the school finance system, automatically, focus shifts to this topic. Legislators, state agencies, and school district leaders turn their attention toward the central issue in the lawsuit. When that issue is adequacy of students' education, legislatures, in an effort to intercept potential adverse effects, often initiate bills focused on improving adequacy for all students. Adequacy claims, unlike equity claims, generally focus on an appropriate level of resources needed to achieve educational results. Jacobs (2010) explained, "In effect, funding provided for an inadequate education for some students, and reform of the school funding system was necessary to meet the threshold of an adequate education for all" (p. 250). When the

lawsuit calls into question a system that potentially fails all students, policy makers are thrust into action. Whether actual changes are made to the school finance structure to avoid potential legal struggles, increased visibility of educational issues occurs, or additional resources are allocated to instructional categories at the state or district level, an increase in overall achievement is likely with such an emphasis on overall students' needs in education.

Research question 2 asked, "Is there a statistically significant relationship between overall student achievement in reading and math as measured by scale scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states that have had have had a plaintiff victory in an adequacy lawsuit?" The findings revealed that there was not a significant relationship between NAEP scale scores for fourth and eighth grade students in reading and mathematics and whether or not states have experienced a plaintiff victory in an adequacy lawsuit. Considering the discussion regarding the impact that filing an adequacy lawsuit may have on state systems and policy, this finding is not entirely surprising. With a lawsuit looming in the state, policy makers often work to craft plausible solutions prior to the actual outcome in court. In such cases, the plaintiff victory may be the culminating legal event and reforms could potentially have already been introduced and enacted. As a result, when looking at overall student performance, gains are already increasing with time. Additional gains are realized with the filing of a lawsuit, but by the time the plaintiff meets success in court, there is not a direct relationship between gains for students overall and such a legal victory.

Research question 3 asked, "Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and in states in which an adequacy lawsuit has been filed?" The results indicated that there was not a significant relationship between NAEP scale scores in mathematics for fourth and eighth grade students living in poverty and the filing of an adequacy lawsuit. In reading, mixed results were realized. Considering reading achievement for students living in poverty, the filing of an adequacy lawsuit was not a significant predictor of reading achievement in fourth grade; however, there was a statistically significant relationship between the filing of a lawsuit and reading performance in eighth grade. With scores increasing nationally as a function of time, the filing of a lawsuit increases this impact in eighth grade reading for students living in poverty.

Several plausible explanations exist for this finding. Adequacy suits, in general, are concerned with providing a level of resources up to a certain standard of quality. "No Child Left Behind (NCLB, 2001), the revised Elementary and Secondary Education Act (ESEA), was intended to close achievement gaps" (Fisher, 2007, p. 160). Under the Elementary and Secondary Education Act, additional funds have been allocated to serve schools and target school populations who are economically disadvantaged. With these funds, "Many incorporate instructional practices such as tutoring, additional time for reading instruction, and regular performance assessments that are of particular value to students who have traditionally struggled in school" (Gross, Booker, & Goldhaber, 2009, p. 114). With additional focused practices that

directly impact student instruction, one "…might reasonably expect these programs to affect some students more than others" (p. 114). Considering the impact of adequacy lawsuit filings, it is then plausible to consider the implications of this statement. NAEP scale scores in reading and mathematics are already increasing over time. Couple this growth with that which results from targeted instructional interventions for students living in poverty. According to the predictor equation, there is a positive relationship between the filing of an adequacy lawsuit and student achievement for students living in poverty for fourth and eighth grade reading and mathematics, but the gains are not statistically significant, except in eighth grade reading. It is conceivable that the other instructional remedies offered to students living in poverty have resulted in growth, and the additional growth resulting from a lawsuit filing is not as influential in raising scores.

The one exception in the model was eighth grade reading. Historically, there has been a tremendous focus on reading in the early elementary grades, and there is not always as much emphasis on and resources allocated to reading for middle and high school students. The impact of these practices is evident in looking at the NAEP scores in reading over time. "Although a higher percentage of fourth graders read at the proficient level on the National Assessment of Educational Progress in 2007 than in previous years, there has been no change in the percentage of eighth graders reading at or above this level since 1992" (Kim, Capotosto, Hartry, & Fitzgerald, 2011, p. 184). Adolescent literacy has only recently gained national attention, and states are beginning to formulate long-range plans to address this concern. Since the area of eighth grade reading has not received the exposure or the resource allocation that elementary grades

have over time, it is plausible that the filing of an adequacy suit brings this issue to the forefront, and states respond in a way that allocates high yield resources to this area.

Research question 4 asked, "Is there a statistically significant relationship between student achievement for students living in poverty in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?" The results indicated that there was not a significant relationship between achievement for students living in poverty in reading and math and a plaintiff victory in an adequacy lawsuit. The same logic applies in this situation as with the filing of a lawsuit. With the growing national scrutiny of holding states accountable for all students, state and federal funds have been funneled to states and in turn districts to ensure that students who are living in poverty have increased access to educational services and resources. The actual victory in an adequacy lawsuit may not have the lasting impact that other factors have had due to the national focus on addressing achievement gaps that exist between all students and students living in poverty.

Another point to consider is that for students living in poverty, often basic survival needs have not been met. Neither the filing of an adequacy suit nor a plaintiff victory in an adequacy suit addresses the basic needs students have in order to survive and thrive in society. Until such needs are met, it is possible that academic gains may not be realized. The results in this study are consistent with findings in previous studies. Glenn (2006) also found that students classified as low socioeconomic status did not benefit from adequacy litigation as evidenced by increased NAEP scores.

Research question 5 asked, "Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states in which an adequacy lawsuit has been filed?" With the exception of eighth grade Hispanic students in reading, the results indicated that there was not a statistically significant relationship between student achievement for minority students in reading and math and the filing of an adequacy lawsuit. Most states face alarming "disparities in achievement between different groups based on language, ability and ethnicity" (p. 160). "Recent educational policy has attempted to alleviate glaring achievement gaps within increasingly diverse student groups in the USA" (Fisher, 2007, p. 159). States, districts, and school sites strive for reaching adequate yearly progress for all subgroups of students. With the multitude of available instructional programs and the continued examination of the persistent achievement gaps, it is likely that the filing of an adequacy suit does not translate into specific resources allocated to minority student populations. While this sense of equality for typically disadvantaged student groups was an important goal of equity lawsuits, it has not been the only focus of the more recent adequacy lawsuits. The mere filing of a lawsuit may not necessarily spark a decision to ensure equitable distribution of resources across subgroups of students within a state.

Question 6 posed, "Is there a statistically significant relationship between student achievement for minority students in reading and math as measured by scaled scores on the fourth and eighth grade National Assessment of Educational Progress (NAEP) and states that have had plaintiff victory in an adequacy lawsuit?" For both

African American and Hispanic students in fourth grade, the regression models revealed a statistically significant relationship between reading and mathematics achievement and a plaintiff victory in an adequacy lawsuit. Likewise, for eighth grade Hispanic students, a significant relationship was realized in mathematics. Similarly, Glenn (2006) also found a positive relationship between adequacy litigation and NAEP scores for African American students. It appears that while the filing of a lawsuit did not lead to measurable changes in student performance for African American and Hispanic students as a whole, the actual victory in such a lawsuit rendered a positive difference. Following such a victory, policymakers are tasked with the challenge of examining the state's finance system and responding to the court's statements about the shortcomings as they relate to adequacy. Sometimes this leads to a complete overhaul of the system, as was the case in Texas. In the process, states must examine the impact on various student groups. The concentration and public scrutiny can lead to reforms that benefit diverse student groups.

**Conclusions**

In summary, NAEP scores are rising nationally over time, with the exception of reading scores for students in eighth grade. For certain subgroups of students, the filing of a lawsuit or the state having lost a lawsuit has increased that impact in reading or in mathematics. Consistencies exist between the results in this study and those analyzed previously and indicate that adequacy litigation can impact the lives of students.

1. The filing of an adequacy lawsuit can contribute to student achievement outcomes for students overall.

2. Adequacy litigation that results in a plaintiff victory can impact achievement among minority student populations, particularly in fourth grade.
3. With the many influences on student achievement, students living in poverty do not appear to benefit from adequacy litigation.
4. School finance litigation can contribute to overall reform efforts in education.

**Recommendations**

School finance litigation historically has been introduced to improve educational outcomes for students. The issue of establishing school finance systems presents some politically charged debates in many cases. The courts offer a different avenue by which to address concerns over the adequacy issue, often with less political risk. In light of the findings in this study, additional topics for future research include an analysis of why the achievement of students living in poverty was not positively affected by the filing of a lawsuit or a plaintiff victory. Equally important to consider is how resources are allocated once a state is faced with an adequacy lawsuit or loses a case in court. One aspect that is not included in this study is the actual funding that is allocated to the instructional category of spending in each state. Future work could include an additional analysis which includes an expenditure category for each year for every state and an exploration of the relationship between the actual dollar changes over time and school finance litigation.

Information gleaned from this study suggests that there are certain students who benefit from a plaintiff victory in an adequacy lawsuit. One aspect that is not included in the study is the type of reform that was enacted as a result of such a victory. In

Texas, for example, there have been a series of reforms initiated in response to *Edgewood*. Future work may include an analysis of each of the reforms and the relationship between the judicial decision-making and subsequent legislative policy making.

Similarly, while NAEP does provide in more recent years scale scores for other subgroups of students, such as students with disabilities and students who are English language learners, this study did not explore the relationship between school finance litigation and the achievement of students in these specific subgroups. Gender was also not a factor for analysis in this study. An area for additional research may be a closer examination of these subgroups of students and the relationship between adequacy litigation and achievement.

As mentioned previously, one of the limitations in this study dealt with the ability to compare student achievement across states. A new era in the standards movement has emerged with the creation of the Common Core State Standards. In this movement led by the National Governors Association and Council of Chief State School Officers, states participated in the creation of a common set of standards to guide teaching in mathematics and English language arts. New assessments will be introduced in the next few years to measure student progress according to the Common Core State Standards. The possibility of common assessments across states may introduce a new mechanism by which to gauge the relationship between school finance litigation and student achievement. Future research focused on this relationship using data gleaned from new common assessments based on a set of standards in both reading and mathematics would be beneficial.

## Summary

The purpose of this study was to explore the relationship between adequacy litigation and student achievement. Through dissecting adequacy litigation in each of the fifty states, this study examined the impact on student achievement as shown by scale scores in reading and mathematics on the National Assessment of Educational Progress (NAEP). Some significant findings were realized that can inform future policy decisions. Adequacy litigation can contribute to growth in student achievement outcomes for students overall and for minority student populations. As researchers continue to study the impact of federal and state policies on student achievement, the results from this study contribute to the complex nature of reducing achievement gaps and increasing educational opportunities for all students. This study contributes to the overall picture of the relationship between school finance litigation and the translation into student gains by verifying that adequacy litigation, in conjunction with comprehensive reform efforts, is likely over time to contribute to growth in student achievement.

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