

THE RELATIONSHIP OF THE CORE ACADEMIC TEACHER STATISTIC TO THE
NORTH CAROLINA READING END OF GRADE EXAM: A CORRELATIONAL
ANALYSIS

Justin Bartholomew

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctorate of Education in the School of Education.

Chapel Hill
2009

Approved By:
Advisor: Dr. Fenwick English
Reader: Dr. Stanley Schanker
Reader: Dr. Catherine Zimmer
Reader: Dr. James Veitch

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ABSTRACT

JUSTIN BARTHOLOMEW: The relationship of the core academic teacher statistic to the North Carolina reading End of Grade exam: A correlational analysis
(Under the direction of Dr. Fenwick English)

The Odden et al (2003) model of school expenditure suggests that one of its instructional components of expenditure, core academic teacher (CAT), positively impacts student achievement on standardized assessments. Hanushek (2007) has argued that this model is self-serving and requires additional spending revenue for schools, which already has proven an ineffective strategy. This study developed a CAT statistic and used the per pupil expenditure (PPE) for every public school district in North Carolina (N = 115) and correlated it to third grade student achievement on North Carolina's Reading End of Grade exam (NCREOG) to determine if any such significant relationships exist. The major research hypothesis for this study was that public school districts with a higher core academic teacher statistic would show greater student achievement on the NCREOG standardized assessment for third grade students than public schools districts with a lower core academic teacher statistic. The results of this study revealed a positive, significant correlation between CAT and third grade student achievement on the NCREOG ($r = .304$, significant at the 0.01 level). A significant, negative correlation was revealed between PPE and student achievement on the NCREOG ($r = -.215$, significant at the 0.05 level), which was magnified when the influence of CAT found in PPE was removed ($r = -.382$, significant at the 0.01 level). The impact of PPE, CAT, and PPE without the CAT influence on student achievement on the

third grade NCREOG is examined and discussed along with implications of these results for leaders in regards to the allocation of school funds.

AKNOWLEDGEMENTS

This study would not have been possible without the support of many individuals. I would like to thank each of my dissertation committee members—Dr. Stanley Schainker, Dr. Catherine Zimmer, and Dr. James Veitch—for their feedback, support with data, and support throughout this process. Dr. Fenwick English, the Chair of the committee, who was and remains a great source of support and perspective, provided tremendous guidance, and I am extremely grateful to have had the opportunity to work with him on this endeavor.

Certainly a great amount of thanks to my wife, Katie, who throughout my education has shouldered the burden of trying to keep up with our children while I was away at class, studying, or writing (which was very often). Additional thanks to my family for their constant support.

Finally, none of this would have been possible without the efforts of every single one of my teachers, past and present: those who taught me how to think critically and analytically; those who taught me how to read letters, and those who taught me how to read and interpret the most challenging of prose; those who taught me how to do basic mathematics, and those who taught me complex mathematics; those who nourished me as though I was their own son, and those who guided me as a peer. Their words, skills, thoughts, and efforts are present throughout this paper, and I apologize for not being able to do any of them the justice they deserve.

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CHAPTER I

INTRODUCTION

Ever since the famous Kalamazoo decision of 1874, taxing the general public for support of public schools has remained contested and controversial. Then, as now, questions regarding the value of dollars spent and the tangible results obtained remain contentious. The utilization of production-function (or input-output) analysis to determine effective and cost-efficient school spending behaviors has promised an approach to policy analysts that shows potential strategies for improving student achievement. One input statistic in particular, per pupil expenditure (PPE), has proven to be an enduring concept.

The per pupil expenditure statistic has been used by researchers and education policy analysts as an account of how much funding schools are spending on an annual basis. And since the Coleman Report of 1966 (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, & York, 1966), PPE has been utilized extensively as a reliable statistic in accurately portraying how much schools are spending on the learning process in education. However, during the 1980s and 1990s, PPE became a flash point in the debate about efficiency as researchers, educators, and economists argued about the value of increasing funds to schools as the results from production-function studies were showing inconsistent correlations in student achievement when funds were increased or decreased (Greenwald, Hedges, & Laine, 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1991, 1996a, 1996b; Hedges, 1996; Laine, 1996). While some studies concluded there were strong positive correlations between increased PPE and student achievement (Greenwald et al., 1994, 1996a, 1996b;

Hedges, 1996; Laine, 1996; Greenwald et al., 1994, 1996a, 1996b; Laine, 1996), other studies concluded that increasing PPE had little to no impact on student achievement (Hanushek, 1981, 1986, 1991, 1996a, 1996b). It was not until the late 1990s that researchers began to break apart the PPE statistic and analyze how the various components within that statistic impacted student achievement on standardized exams (Harter, 1999; Odden, Archibald, Fermanich, & Gross, 2003; Odden, Mangan, & Picus, 2006; Odden et al., forthcoming).

Recognizing that PPE was a far more complex statistic than previously thought, Odden et al (2003) developed a comprehensive model that took the PPE statistic and divided it into two major components (instructional and non-instructional) and then subdivided each of these major components into smaller components (*Figure 1*). Each of these smaller components can be used as inputs in a production-function study to determine their impact on student achievement on standardized assessments (*Figure 2*). Of these components, Odden et al (2003) identified one in particular that they believed to be the most important in improving student achievement, that of the *core academic teacher* (CAT) (Odden et al., 2003; Odden et al., 2006, slides 33 & 34).

The CAT is estimated by “multiplying the number of full-time equivalent (FTE) teachers in the expenditure element by the teachers’ salary plus fringe benefits” (Odden et al., 2003, p. 331). At an elementary school level, however, the core teacher is that individual with whom students learn the four subject areas and, therefore, is identified as “the licensed classroom teachers primarily responsible for teaching... in the self-contained regular education classrooms” (p. 331). In 2006, Odden et al. prepared a summary for the Arkansas Senate and House Adequacy Study Oversight Committee where Odden and his associates proposed a plan to regulate the way in which public school districts were reporting their

funds. The intent was to mainstream the reporting process to fit the model developed in 2003. In this summary, Odden et al. stated that, while PPE had drastically increased over the past several decades in Arkansas, student achievement had not increased, and the salaries to core academic teachers had actually decreased when inflation was taken into consideration. They argued that the extra funds received by schools went to resources outside of the classroom and consequently did not result in student achievement increases. They suggested that increasing funds to the CAT component of school funding would result in increased student achievement.

If the CAT statistic is in fact strongly correlated to student achievement, school districts and state school system leaders would need to seriously consider revamping school funding structures to maximize the likelihood of increasing student achievement within these schools.

In North Carolina, the measurement of student achievement on statewide standardized tests begins in the third grade, with both a reading and a math assessment. As reading performance has been shown to be a major predictor of future achievement throughout a student's entire educational career (Baydar, Brooks-Gunn, & Furstenberg, 1993; Cunningham & Stanovich, 1997), it is of particular interest to determine if, in North Carolina, the presumptive correlation between CAT and student achievement on a standardized reading assessment does exist as predicted by Odden et al. (2003, 2006). If a correlation is found to exist, then state and system school leaders could begin to increase resources to the CAT subcategory of PPE, which would result in greater student achievement. Such improvements on student scores early in elementary school would also

mean that these students would be likely to be successful on future standardized assessments all the way through high school (Baydar et al., 1993; Cunningham & Stanovich, 1997).

Statement of Problem

Improving student achievement is a rationale often used to increase revenue via taxation at the state level, where such revenue is still the major source of support for public schools (Thompson & Wood, 2005). As revenue is increased, so is the per pupil expenditure. However, production-function studies that correlated increased expenditure by schools to promote and implement programs designed to increase student achievement as measured by standardized exams have found conflicting results (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1991, 1996a, 1996b; Hedges, 1996; Laine, 1996). One plausible reason for such differences may be the fact that one of the most critical and commonly used statistics in production-function analyses is the per pupil expenditure (PPE) statistic. While this statistic has been consistently employed since the release of the Coleman Report in 1966, PPE has recently been criticized for not accurately measuring the impact of various school expenditures on student achievement as measured by standardized exams (Harter, 1999; Odden et al., 2003, 2006, forthcoming).

Both Harter (1999) and Odden et al. (2003) have developed models in which they break the PPE statistic into two major categories: instructional and non-instructional. Odden et al. (2003) continues to divide the instructional per pupil expenditure (IPPE) subcategory into even smaller components. One of these components is the core academic teacher statistic (CAT). It is this variable that is central to this study.

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

Figure 1: Model developed by Odden et al (2003) used to breakdown PPE into both Instructional and Non-Instructional components of PPE, p. 330.

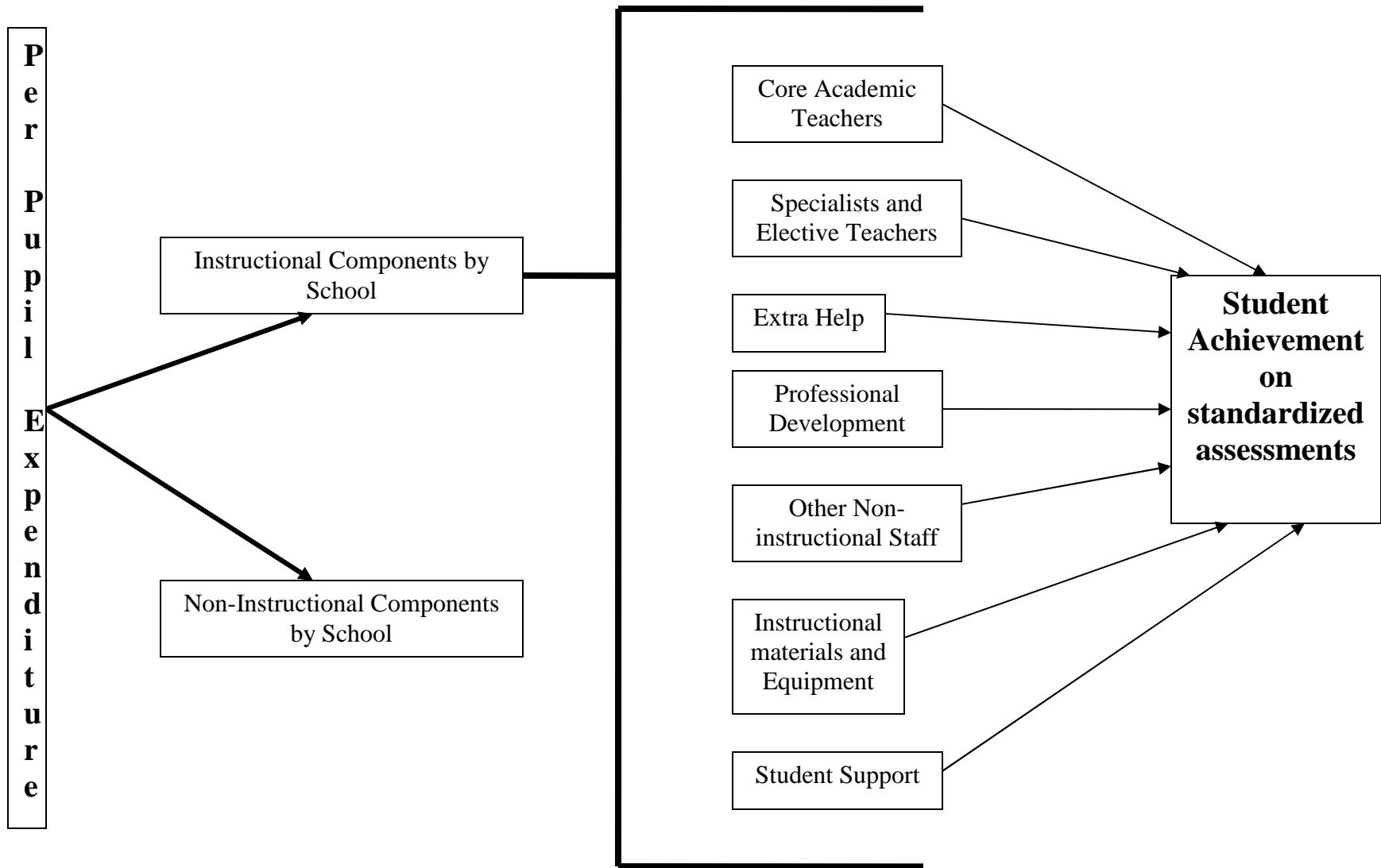


Figure 2: A conceptual model adapted from Odden et al. (2003) depicting how PPE is broken down and eventually correlated to student achievement on standardized assessments.

Purpose of Study

The purpose of this study was to examine the relationship among the instructional per pupil expenditure (IPPE) component, the core academic teacher statistic (CAT), and third grade student achievement on North Carolina's Reading End of Grade (NCREOG) standardized assessment. While the literature is inconclusive regarding the impact of increased funding on student achievement as measured by standardized exams (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1991, 1996a, 1996b; Hedges, 1996; Laine, 1996), recent studies have taken the complex educational statistic, per pupil expenditure (PPE), and divided it into both instructional components (IPPE) and non-instructional components (NPPE) (Harter, 1999; Odden et al., 2003, 2006, forthcoming). These recent studies have identified potential instructional funding areas that correlate to student achievement. Of particular interest and importance is student achievement in reading, as these skills strongly correlate with future academic success (Baydar et al., 1993; Cunningham & Stanovich, 1997). In their presentation to the Arkansas Senate and House Adequacy Study Oversight Committee, Odden et al. (2006) suggested that the CAT is a key determiner of increasing student achievement on standardized assessments (slides 31-33, 76, 77). In this presentation, they correlated low student performance on both the literacy and mathematic state tests to lower PPE (slide 21). As Odden et al (2006) argued, schools that receive additional funds typically mismanage it. Were these additional funds focused in an area such as CAT, there would be a greater likelihood of increasing student achievement. In North Carolina, it is not known if the IPPE component of the CAT identified by Odden et al (2003) correlates to the critical skill of reading. Should a correlation be found, this information could be used

by state and local officials to develop clear spending guidelines that would focus spending on subcategories such as CAT, which may correlate to increased student achievement.

Research Design

The research design for this study followed a framework (see *Figure 3*) that is a modified version of the Odden et al (2003) model (*Figure 2*). This framework was utilized to determine if the CAT statistic correlates to student achievement on North Carolina's third grade Reading End of Grade assessment (NCREOG). To accomplish this, PPE data, racial data, student achievement data, and other demographic information from all 115 school districts in North Carolina (North Carolina Public Schools, 2007) were utilized in this proposed study. The most recent published data that include all of these variables were compiled from the 2005-2006 school year.

The CAT statistic for this study required the following information for each teacher: average salary, average supplement, social security, liability insurance, retirement, and hospitalization insurance. The value of these teacher benefits for the 2005-2006 school year were acquired for each district from both the Finance and Business Services Division of North Carolina Public Schools as well as the annual publication of the *North Carolina Public Schools Statistical Profile 2007*. The data on the total number of students enrolled in the third grade taking the NCREOG were acquired from the North Carolina Public Schools Accountability Services Division (NCPSASD) of the North Carolina Department of Public Instruction located in Raleigh, North Carolina. The average PPE for the identified school districts was acquired from the *North Carolina Public Schools*

Statistical Profile (2007), a document published by North Carolina's Department of Public Instruction and distributed to all school systems and the public.

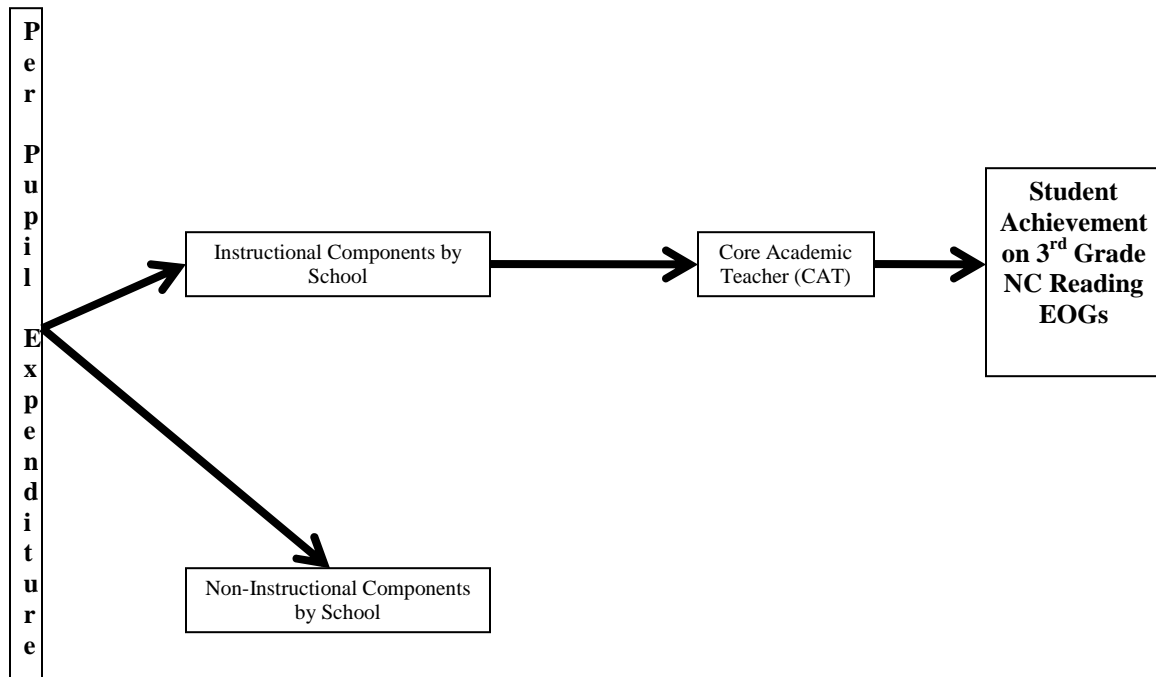


Figure 3: Conceptual framework for proposed study. Modified from Odden et al. (2003).

Data for student achievement and demographic breakdowns for students passing the third grade NCREOG in each school district were obtained from the NCPSASD, which is a clearing house for all testing data for K-12 schools in North Carolina. Reading scores on the third grade NCREOG were obtained for the 2005-2006 school year from the NCPSASD.

Once computed, the CAT statistic for each school district and the third grade achievement data on the NCREOG for that school district were correlated to determine if there is a statistically significant relationship. Other variables such as:

- total number of students taking the third grade NCREOG,
- percent of proficient students who are economically disadvantaged,

- percent proficiency of all identified racial groups,
 - percent of proficient students not economically disadvantaged,
 - percent of proficient LEP students,
 - percent of proficient non-LEP students,
 - percent of proficient students whose parent(s) did not complete high school,
 - percent of proficient students whose parent(s) graduated from high school only,
 - percent of proficient students whose parent(s) graduated from high school and had some other courses,
 - percent of proficient students whose parent(s) graduated from a trade or business program,
 - percent of proficient students whose parent(s) completed a two-year degree or junior college,
 - percent of proficient students whose parent(s) attained a four-year degree,
 - and percent of proficient students whose parent(s) completed a graduate degree
- will also be collected and used in a multiple regression analysis. The results of this analysis permitted an examination of the correlations between CAT and student achievement on the third grade NCREOG as well as possible correlations of CAT to the previously mentioned variables.

Assumptions

The following assumptions were germane to the proposed study:

- It was assumed that revenue spent on instruction does impact education, either negatively or positively. That is, the amount of money school leaders appropriate

towards instructional components impacts student achievement one way or another, and that impact is subject to derivation and subsequent analyses.

- It was assumed that core academic teachers are critical to student achievement, as proffered in the model by Odden et al. (2006) that core academic teachers (or grade level teachers in elementary schools) are a major cause of improved student performances on standardized assessments. Odden et al. (2006) also influenced this study because of their identification in Arkansas of the correlation between the funding of core academic teachers and students' achievement on standardized assessments.
- It was assumed that NCREOG scores acquired from North Carolina's Accountability Services Division are accurate for the all of the districts included in this study.
- It was assumed that the salary and benefit information, as well as the various achievement data collected from the school districts included in the study, are accurate and the data reported to the researcher by the state are accurate.

Limitations

This study intended to examine how CAT impacts third grade NCREOG achievement in all North Carolina school districts. Ideally, the CAT would have been developed utilizing individual third grade teacher salary information along with their respective benefits from each school district in North Carolina. These data, however, are no longer available, as North Carolina reportedly purged this information when it started utilizing new software during the 2006-2007 school year. Consequently, this study used a district average salary for core academic teachers (preschool through twelfth grade), which means that salaries of teachers who may not have had an impact on these students

were also included. Similarly, the salaries of those who have impacted the students (kindergarten through second grade teachers) were included in the CAT. With this study using average salaries and average benefits for all teachers in the district, the specificity results were not able to state with certainty, regardless of analytical results, that a CAT statistic for third grade teachers correlates to third grade students' achievement on the NCREOG. Rather, the study was only able to correlate the district CAT to the third grade student achievement on the NCREOG.

The Odden et al. (2003) model employed in this study utilized seven IPPE components to measure relationships to student achievement. This study used only one of those seven components. The Odden et al. model was intended for use by large school systems and entire states, and this model was implemented by the Wisconsin Center for Educational Research (WCER) in 2003. WCER is a large organization where analysts and consultants continuously work with governments to implement the model. This study was structured differently and did not have that capability. Using only one of the seven IPPE components identified in the Odden et al. model limited the scope of what could be concluded about the expenditure of funds for all IPPE components. Significant results, however, may allow for general inferences to be made specifically about the district CAT effect on third grade student achievement on the NCREOG in the school districts included in the scope of the study. Where resources are readily available and the full range of variables is desired to be assessed, future studies could implement the full Odden et al. model across the state of North Carolina.

Hypotheses

Major Research Hypothesis

The major research hypothesis for this study was that public school districts with a higher core academic teacher (CAT) statistic would show greater student achievement on North Carolina's Reading EOG (NCREOG) standardized assessment for third grade students than public schools districts with a lower core academic teacher statistic.

Research Hypotheses

In addition to the major research hypothesis, the investigator also sought to determine if the CAT for each school district correlates with other demographic student achievement variables on NCREOG standardized assessment. Such student achievement variables include:

- percent of proficient students who are economically disadvantaged,
- percent proficiency of all identified racial groups,
- percent of proficient students not economically disadvantaged,
- percent of proficient LEP students, percent of proficient non-LEP students,
- percent of proficient students whose parent(s) did not complete high school,
- percent of proficient students whose parent(s) graduated from high school only,
- percent of proficient students whose parent(s) graduated from high school and had some other courses,
- percent of proficient students whose parent(s) graduated from a trade or business program,
- percent of proficient students whose parent(s) completed a two-year degree or junior college,
- percent of proficient students whose parent(s) attained a four-year degree,

- and percent of proficient students whose parent(s) completed a graduate degree.

The null hypothesis for this study was that no statistically significant correlation would exist between the CAT and student proficiency based on these demographic variables. The alternative hypothesis was that statistically significant and positive correlations exist between the CAT and student proficiency based on these demographic variables.

Definition of Terms

The following is a list of terms that are used throughout this study:

- *North Carolina End of Grade Reading Assessment for third grade (NCREOG)*: In the state of North Carolina, annual standardized exams are given to all students in Grades 3 through 12 in several different areas. These assessments are called End of Grade Assessments (EOGs) in Grades 3 through 8 and End of Course Assessments (EOCs) in Grades 9 through 12. The subject areas assessed by the EOGs in Grades 3 through 8 are math and reading. Additionally, there is also a writing EOG that is given in Grades 4, 7 and 10. Science is assessed in Grades 5 and 8 only. Each of these assessments requires that a student answer anywhere from 70 to 95 multiple choice questions. The questions are based on North Carolina's Standard Course of Study (NCSCoS), which outlines the major curriculum concepts that should be covered throughout the year for each of these subjects in the respective grade level. The EOCs are standardized assessments taken at the conclusion of several high school courses. There are a total of 11 EOCs given in high school: Biology, Physical Science, Chemistry, Physics, Algebra I, Algebra II, Geometry, Civics & Economics, United

States History, English I, and Occupational Course of Study (*North Carolina End-of-Course Tests*, 2008).

- *Per Pupil Expenditure (PPE)*: Simplistically, per pupil expenditure, when taking into account local, state, and federal funds, can be defined as the “total current operating expenditures on a per pupil basis. Some examples are instructional materials, maintenance, and transportation” (Report Card Terminology, 2002); or “total expenditures (minus equipment, facilities acquisition and construction services costs, and debt service costs) divided by total student enrollment” (Per Pupil Expenditure, 2003). North Carolina’s Department of Public Instruction (NCDPI) has explicitly described the components it uses to define the PPE statistic. NCDPI has defined PPE as “computed only for current expense expenditures (excluding community services, Head Start, adult education, and inter/intra fund transfers) by using final average daily membership (ADM)” (North Carolina Public Schools, p. 40).
- *Instructional PPE components (IPPE)*: Odden et al. (2003) have identified the following as components of IPPE: Core Academic Teachers, Specialist and Elective Teachers/Planning and Preparation, Extra Help, Professional Development, Other Non-Classroom Instructional Staff, Instructional Materials and Equipment, and Student Support.
- *Non-instructional PPE components (NPPE)*: Odden et al. (2003) have identified two areas as being NPPE: Administration, and Operations and Maintenance.
- *Core Academic Teacher (CAT) statistic*: The IPPE *core academic teacher* (CAT) described by Odden et al. (2003) is estimated by “multiplying the number of full-time equivalent (FTE) teachers in the expenditure element by the teachers’ salary plus fringe

benefits” (p. 331). Teachers at the elementary level are identified as “the licensed classroom teachers primarily responsible for teaching... in the self-contained regular education classrooms” (p. 331). The CAT used only those teachers teaching “a school’s core academic subjects of reading/English/language arts, mathematics, science, and history/social studies” (p. 331). This study developed a CAT statistic using average salary and fringe benefit information for teachers in each North Carolina school district. The CAT statistic represents a sum of the following variables: average teacher salary (TS), average supplement (SU), average liability insurance (LI), average retirement (RE), average social security, and the average hospitalization insurance paid by each school district.

- *Student Achievement:* The percentage of students proficient on the third grade NCREOG was used to determine student achievement in this study. In North Carolina, students receive a raw score, scaled score, percentage, and a proficiency scores. Students’ proficiency scores are used to determine the overall proficiency level of a school in a specific subject area. A student can receive a one, two, three, or four on an EOG or EOC for proficiency. Students receiving a four or three are considered proficient. Students who receive a two that is within one standard error of a three are also considered to be proficient. All other scores are categorized as non-proficient.

CHAPTER TWO

LITERATURE REVIEW

The funding of public schools in America has been a very complex undertaking. This chapter provides an overview of the literature as it relates to the financing of public schools, the relationship between PPE and student achievement, the incorporation of standardized exams into the public educational system, and the correlation between student achievement on these exams and their ability to predict future academic successes. Following the review of literature, the chapter provides an examination of a comprehensive production-function model that is currently being used to show correlations between components of PPE and student achievement. The chapter concludes with a discussion and rationale for utilizing a proposed conceptual framework that could be applied in the state of North Carolina.

Literature Review

Introduction

The recent blitz of high-stakes, end-of-year exams has served to act as an accountability tool for local, state, and federal governments as well as the media. While many researchers and policy analysts see such an accountability design as being racially biased, detrimental to local school districts, and a platform for the advancement of the conservative agenda of privatizing public schools (English, 2002; Karp, 2002; Saltman, 2000), school leaders have no choice but to deal with the pressure of finding some success within these trends.

With many schools limited in funds, the option to try a strategy one year and attempt a different strategy the following year is both financially burdensome and time-consuming. Schools with limited local funding sources are further burdened as the special state and federal funding they receive to adequately function is often tied to requisites of various testing measures and formal paperwork. In response to these pressures, many advocates of public schools call for greater funding in order to help these school leaders develop programs or professional development activities that will in turn help to improve test scores (Alexander, 1998; Dunn & Derthick, 2007; Ellinger, 1995; Greenwald et al., 1996a; Lewis, 2005; Payne & Biddle, 1999; Wenglinsky, 1997). But does increasing school revenue really make a difference?

The question of whether increasing school revenue raises student achievement on high-stakes exams has been argued extensively, with few definitive answers and many strong opinions. The debate began in 1966 with the findings of the “Coleman Report” (Coleman et al., 1966), which found the relationship between school funding and student achievement to be insignificant. Since that time, numerous studies have been published showing that it does not matter how much money schools are given; this revenue cannot increase student achievement. Eric Hanushek (1981, 1986, 1989, 1996a, 1996b) has conducted research showing that simply increasing school revenue in order to increase student achievement does not work. Conversely, numerous studies have found quite the opposite effect, with increases in per pupil expenditure showing improvement on high-stakes exams (Biddle & Berliner, 2002; Bracey, 1996a, 1996b, 1997; Greenwald et al., 1996a, 1996b; Laine et al., 1996; MacPhail-Wilcox & King, 1986a, 1986b).

The Funding of Public Schools

History of Funding Public Schools

On July 2, 1909, Congress passed the 16th Amendment, later to be ratified on February 3, 1913. The 16th Amendment provided the federal government with the power to tax the American people, regardless of state population. The first federal tax in 1913 was set as a one percent income tax (Terrell, 2007; Thompson & Wood, 2005). Since that time, the federal income tax has continued to be a major source of revenue for public schools and numerous public programs. While it may be thought that the federal system is one of the largest contributors to the funding of public schools, it is quite the opposite. In 2003, the federal support for K-12 public schools accounted for \$32.8 billion, which was roughly 7.3% of the total public school revenues. The federal income tax remains the lone federal support for local schools that implement federal programs, both mandatory and voluntary.

The largest source of public school funding has been and continues to be state governments, which, on a national average, accounted for 49.7% of the public school revenue in 2001 (Thompson & Wood, 2005). The second leading source of public school funding is typically the local government, which, in 2001, provided 40.8% of the revenue necessary to fund public schools. The equity of the dispersal of these funds is often called into question, so states have developed various funding formulas to help balance out the revenue available to local school districts (Thompson & Wood, 2005).

The connection among money, education, and the government is politically intertwined. Money will always be tied to any government-sponsored program, and in education, the funding that is required is enormous. The American taxpayers have a vested interest in education, not just because they have children or relatives in the public

school system, but because the taxes they pay directly impact the amount of money that is provided to the public school system. This annual tax revenue for public schools can come from one or more of the following three sources: federal government, state government, and local government.

The Federal Tax System

The federal tax system has attempted to tax the American public since the 1700s and is currently viewed today by many Americans as being a system that is out of control (Terrell, 2007; Thompson & Wood, 2005). After various attempts to develop a tax that was somewhat equitable for all Americans, the federal government implemented the first income tax to develop federal income in 1913 at the rate of one percent (Terrell, 2007; Thompson & Wood, 2005). Since that time, the federal income tax has continued to be a significant source of revenue for public schools and numerous public programs. This federal income tax remains the lone source of federal support for local schools that implement federal programs, both mandatory and voluntary (Thompson & Wood, 2005).

The State Tax System

The state tax system is the major source of funding for public schools in the United States. While the federal government is limited by the Constitution in its ability to tax the public only for the payment of debt and the welfare of the United States, the state government does not have such restrictions. State governments have the ability to tax as they see appropriate, because each state has been put in control of its own government and of the local governments within that state. On a national average, states accounted for 49.7% of the public school revenue in 2001 (Thompson & Wood, 2005). While methods vary from state to state, the major sources of state tax revenue are property taxes, income

taxes, and sales taxes. These taxes, therefore, are critical for financing public schools and making sure that students are entering school buildings that have adequate resources.

The Local Tax System

While states are often the largest source of revenue for local school districts, the second largest source of revenue for schools is the local government (e.g., counties, cities, or individual school districts). Even with the state's being a critical source of revenue for public education, most states consider local control of tax revenues (state and local) to be important for expenditure on public schools. Local funding of public schools typically comes in the form of a local property tax that citizens within that local government must pay in addition to any taxes required by the state and federal tax systems. The equity of the dispersal of these funds is often called into question, so states have developed various funding formulas to help balance out the revenue available to local school districts (Thompson & Wood, 2005).

School Funding Formulas

The formula or model that is used by a state to fund schools depends on how much control that particular state wants to have over the local districts. There are several major types of state funding that can take place, and the method of implementation has been left up to each individual state. These types of funding include flat grants, equalization grants, multi-tier grants, and full state funding grants. The flat grant was one of the original types of school funding in which each public school district in the state received the same amount of money. This system was advantageous in that it assured financial equity from the state, but it kept wealthy districts with the most resources and poorer districts without many resources. Consequently, flat grants from the state are not

used as the sole source of revenue but are sometimes included within other funding formulas (Poston, 2005; Thompson & Wood, 2005).

The equalization grant or program was implemented to correct the weaknesses of the flat grant. This state funding method is based on a series of formulas that takes into consideration what each district's ability is to fund its school system. Under the equalization grant method, districts in poor communities receive a majority of the funds, as they have little tax base to support their schools. Conversely, extremely wealthy school districts may not receive any state funding and are completely dependent upon their local taxes to fund their schools. The advantage of the equalization grants is that the total amount of funds (federal, state, and local) available to each district is similar. The clear disadvantage is that local school districts that are funding their own schools are still subject to state regulations and may have no incentive to keep their higher local tax rate if they can offset the local revenue with state revenue (Poston, 2005; Thompson & Wood, 2005).

The multi-tier grant model incorporates numerous formulas from several different models in an attempt to make funding equal, but it also allows local governments to increase their own funds to accommodate needs that they see as being important. The strength of this model is that each district essentially receives a minimum, or foundation, per pupil amount, but they also have the option of increasing spending on their local school district should they wish to. The weakness is that such a model is heavily subject to local political influence, as local politicians may readily pass policies that either add or remove funds because what is viewed as "important" or "the best way" can quickly change in local politics (Thompson & Wood, 2005).

The final model, which is the full-state funding grant, is an ideal that has been accomplished to an extent in both Hawaii and the District of Columbia. In this formula, the state sets a tax rate that ensures that revenue will come into the state and be equally dispersed to each school so that the per-pupil expenditure is equal. The state is responsible, therefore, for the full funding of all the schools (except for any federal funds that may be received), while the local government contributes no revenue. As a result of the full funding, the state ultimately has control over all of the school districts. This model also has wealthier districts losing money to pay for poorer school districts in a state effort to equalize the per pupil funding. The goal is once again to improve equity of funding, but the decision of what model to use is ultimately a political one (Thompson & Wood, 2005).

Per Pupil Expenditure

Within the literature, there exists a series of terms such as production-function, input-output, school revenue, school funds, etc., to describe the amount of money a school district spends on an annual basis. School budgets tend to be complex and difficult to examine critically because of their many sources of revenue. Each of the major sources of income (local, state, and federal taxes) is broken down into subcategories that specify how money is to be used. As that budget structure is very complex, researchers typically ignore these subcategories and instead break down the budget into a more simplistic measure: per pupil expenditure (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1989, 1996a, 1996b; Odden et al., 2003, 2006). Per pupil expenditure is a variable that allows researchers to examine exactly how much money is being spent on average by each school. Statistics such as total district expenditure, for example, could be greatly

misleading, as a poor, densely populated school district may have greater revenue than a less populated, wealthier district, making the wealthier district appear to be at a financial disadvantage. Per pupil expenditure is commonly utilized because it can accurately portray, without much bias, the amount of revenue school districts are actually spending to educate students. Simplistically, per pupil expenditure, when taking into account local, state, and federal funds, can be defined as the “total current operating expenditures on a per pupil basis. Some examples are instructional materials, maintenance, and transportation” (*Report Card Terminology*, 2002); or as “total expenditures (minus equipment, facilities acquisition and construction services costs, and debt service costs) divided by total student enrollment” (*Per Pupil Expenditure*, 2003). While school systems include local, federal, and state revenue as sources for their district revenue, they also may include any of the following sources of revenue: funds from students who transfer to the district from another district (the former district typically pays expenses at the new district’s rate), private grants or gifts, revenue generated from athletic events and/or school lunches, and rental income from use of facilities (Hatch & Rogers, 2006).

Although the definition may vary from state to state or even district to district, North Carolina’s Department of Public Instruction (NCDPI) has explicitly described the components it uses to define the per pupil expenditure statistic. NCDPI has defined PPE as “computed only for current expense expenditures (excluding community services, Head Start, adult education, and inter/intra fund transfers) by using final average daily membership (ADM)” (North Carolina Public Schools, p. 40). For NCDPI, these expenditures include the federal, local, and state sources of income. The “current expenses” identified in the definition include all expenses that are related to the daily

operation of each public school in the state of North Carolina. As with other PPE definitions, North Carolina's entire PPE statistic is essentially a function of total revenue coming from federal, state, and local sources and then dividing that total revenue by the ADM. ADM is determined by dividing the total number of days students were in school by the total number of days of school for each student in all schools (*Student Attendance and Student Accounting Manual 2007-2008*, 2008). As North Carolina is the focus of this study, the PPE definition identified by NCDPI is its working definition of total PPE.

While per pupil expenditure gives researchers a greater understanding of the amount of revenue districts typically have, it also hides many of the sources of the revenue, as it does not allow for the disaggregation of these funds. Instead, it combines all sources of revenue into one single statistic. For example, a school district may have a PPE of \$8,000 and the neighboring district may have a PPE of \$6,000, but the allotment granted to each of these districts by the various levels of government may be significantly different based on the type of funding formulas that impact each of these schools. Furthermore, simply because PPE is larger in one district than another, the larger PPE does not necessarily indicate that the instructional components of that PPE are greater. As Harter (1999) found in an examination of elementary schools in Texas, non-instructional components of PPE (e.g., health services, extracurricular activities, guidance services) can comprise the second largest percentage of the PPE statistic (teacher salaries is the largest). For this reason, this study implements the model developed by Odden et al. (2003), as it breaks the PPE statistic into specific subcategories that can then be correlated to student achievement.

The Relationship Between Per Pupil Expenditure and Student Achievement

The Coleman Report

The response to the question of whether or not a definitive relationship exists between per pupil expenditure (PPE) and student achievement depends upon who is asked. The first major study to examine this relationship was titled *Equality of Educational Opportunity*, commonly known as the Coleman Report (1966). The Coleman Report was a federally funded production-function research project conducted by seven researchers. Bound by Title IV, Section 402, of the 1964 Civil Rights Act, the federal government was required to conduct a study to determine if inequity existed in various individuals' opportunities to receive an education "by reason of race, color, religion, or national origin" (*Title IV of the 1964 Civil Rights Act*, 1964). The study resulted in what is one of the largest production-function studies ever conducted (King, Swanson, & Sweetland, 2003). The conclusions of the report were extremely controversial, and the methods used to form the conclusions were attacked by numerous studies that soon followed (Thompson & Wood, 2005).

The Coleman Report drew three significant conclusions. The first conclusion was that the funding differences between the white and black schools were not significant and were in fact much smaller than what had been predicted. The second conclusion was that it did not matter how much money schools were given, as the major predictor of student achievement was socioeconomic status (SES). The final conclusion of the Coleman Report was that the achievement level of a student could be predicted based upon the environment in which s/he was schooled. That is, black students would be more successful if they were in a class where the majority of students were white (Coleman et al., 1966; Kalenberg, 2001). Of these three conclusions, the two that drew the greatest

criticism from supporters of funding adequacy and equal opportunities were that the schools (black and white) were equally funded and that increasing funds to public schools did not matter; all that mattered in student achievement was a student's SES (English & Steffy, 2001; Frase, 2005; Saltman, 2000; Thompson & Wood, 2005).

Post-Coleman Report Research through the 1980s

The idea that money would have no effect on student achievement was rejected in later years by numerous authors who had conducted their own studies. Many of these "new studies" that were published after the Coleman Report were inherently flawed, as they purposely sought to discredit and refute its findings (Thompson & Wood, 2005). It was in the early 1980s that an economist named Eric Hanushek began examining PPE and student achievement and obtained results that were very unpopular with most educational researchers as they supported a key finding of the Coleman Report.

In 1981 and 1986, Hanushek published two articles, both concluding that the impact of per pupil expenditure on student achievement was negligible. In both studies, Hanushek sought to investigate the impact of various educational inputs on student achievement. Utilizing statistical studies that had been conducted in public schools, Hanushek focused on five inputs: student-teacher ratio, teacher education, teacher experience, teacher salary, and expenditure per student. While there were numerous outputs examined, the major output focused on student achievement on standardized tests. Hanushek concluded that there was no significant relationship between any of those variables and student achievement. He went on to state that each of those inputs required a great deal of school revenue and that this increase in school revenue was not resulting in increased student achievement. Instead of spending money on these inputs, Hanushek

argued, school systems should develop a reward system for teachers which he called “direct performance incentives” (1981, p. 19).

In the 1986 article, Hanushek explained why the output measurement of student and school achievement is such a difficult one to determine:

Clearly to analyze school production it is essential to employ adequate measures of outcomes. But measuring outputs is not simple. While economic theory concentrates on varying quantities of homogenous output, this is not easily translated into an educational equivalent.

Education is a service that transforms fixed quantities of inputs (that is, individuals) into individuals with different qualities. (p. 1151)

Consequently, Hanushek stated that he favored the use of standardized exam scores, as they are the most commonly used methods of assessing a student’s or a school system’s progress. Hanushek made it clear that he was not suggesting that scores were the best way to measure student achievement; rather, it was the reality of how schools and students were being evaluated. One of Hanushek's findings was a confirmation of what he had previously believed: teachers and schools varied greatly in terms of their effectiveness to increase student achievement. It was in this article that Hanushek called for a reexamination of how schools were spending their money. With roughly two thirds of a school’s budget being spent on instructional expenditure (determined by various factors such as class size and teacher salaries), Hanushek stated that paying individuals simply because they have earned a degree or have been in the system for a long time is faulty. Furthermore, he pointed out that although it was a popular trend, creating policy-driven inputs (student-teacher ratio, teacher education, teacher experience, teacher salary,

and expenditure per student) had not produced significant results. Hanushek's recommendation was that governments stop making policies and stop spending money on inputs that had not been shown to be effective.

Research in the 1990s

The call for reevaluation of expenditure reached a pinnacle in 1996 when Hanushek pointed out that school expenditure had been steadily increasing even though student achievement in the form of Scholastic Aptitude Tests (SATs) and the National Assessment of Educational Progress (NAEP) had shown little improvement since the early 1980s (Hanushek, 1996b). Hanushek reiterated that increasing funds may result in increased student achievement, but the spending he had studied was frivolous and irresponsible because the strategies being funded were flawed.

In response to these articles written by Hanushek, Greenwald, Hedges, and Laine each wrote numerous responses contradicting some of his findings and questioning the method he utilized to measure the effects of teacher-student ratios on student achievement (Greenwald et al., 1996; Hedges et al., 1994; Laine et al., 1995). Although they were originally examining and trying to replicate the work of Hanushek, Greenwald, Hedges, and Laine decided to develop their own database to determine the impact of school funding on student achievement. They concluded that the work of Hanushek was inherently flawed because it used methods that were appropriate at the time of the data collection but were "now regarded as inadequate synthesis procedures (Greenwald et al., 1994, p. 2). While Hanushek had claimed that there was "no systematic relationship between school expenditures and student performance" (1991, p. 425), Greenwald et al.

(1994) found that the conclusions of Hanushek's meta-analysis were faulty and that a positive effects of school finance (inputs) on student performance did exist.

The interesting impact of the Greenwald et al. (1994) research was that it immediately drew a response from Hanushek, leading the two sides eventually to agree on a common point. Hanushek (1994) stated that Greenwald et al. were focusing on the wrong point of the conclusions of his research. Regardless of the statistical methods used, Hanushek argued, the fact was that money was continuously being poured into policies and mandates that may not even work or that could even be detrimental (1994). Greenwald and colleagues (1994) conceded this point when they later wrote that "greater emphasis must be placed on the manner in which resources are utilized, not simply the provision of those resources" (p. 20).

Other researchers have also written on these issues by citing numerous studies that have been conducted and the vast differences in findings. Here is a small sample:

- Finn & Achilles (1990): Students were put in both large and small class sizes.

The study found that the students who were in the classes with a small teacher-pupil ratio did far better than those in the larger classes. (This was a key study that set the small class-size movement in motion, which Hanushek in 1995 reported as being a waste of money because it was based on poor research.)

- Ferguson (1991): This study found that increasing funds to improve teacher quality developed greater student outcomes in Texas.
- Monk (1994): This study found that teachers who were educated in the content areas they were teaching improved student achievement.

- Verstegen (1994): After examining NAEP scores and per pupil expenditure, Verstegen concluded that school revenue could account for one third of the variance shown in the NAEP scores and that the impact was greater for those students of low socioeconomic status.
- Hartman (1994): This study found a significant relationship between school expenditure and student achievement when looking at student performances from school districts of varying socioeconomic communities.
- Ferguson & Ladd (1996): When looking at Alabama schools, this study found that teacher quality and class size have a strong impact on student learning. As both of these factors cost money, they stated that money does impact student achievement.
- Smith (2004): Smith conducted research on more than 65,000 Minnesota students to determine the impact of school spending on student achievement. Smith concluded that, while Minnesota had very minimal increases in spending, there existed a direct association between teacher salary and student achievement: the more money a teacher made, the higher the students' level of achievement.

While the debate about the impact of money on student achievement continues, the studies mentioned above may have had some inherent flaws.

The Troubling PPE Statistic

The contradictions found within the research regarding PPE and student achievement is largely due to the PPE statistic itself. Difficulties encountered by both sides of the PPE production-function argument surround the manner in which school budgets are constructed and reported. Schools receive their funding from the three major

sources: local, state, and federal governments. In school budgets, each government is given its own section within the school budget so that funds remain separate. The difficulty is that each section is broken down into additional subcategories, making school budgets complex and difficult to critically examine. For example, funds for purchasing photocopier paper could come from several subcategories within the federal, state, or local sections. Because of this complexity, researchers typically break down school budgets into a more simplistic measure, per pupil expenditure (PPE) (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1989, 1996a, 1996b; Odden et al., 2003, 2006). While PPE is an input that can easily be compared to student achievement on standardized assessments, it may not accurately depict the production-function relationships. To accomplish this, some researchers have broken down the PPE components into more specific categories, instructional and non-instructional (Harter, 1999; Odden et al., 2003, 2006, forthcoming).

Instructional Components of PPE and Student Achievement

While there is a clear divide in the research about the relationship between PPE and student achievement, the literature has become clearer in regards to various components of PPE and this relationship. Harter (1999) developed a model in which PPE was broken into instructional and non-instructional components. The instructional PPE component (IPPE) was then broken down into eleven categories (teacher salaries, salary supplement, extra-duty pay, substitutes' pay, benefits, school upkeep, professional services, instructional supplies, reading materials, and other instructional). Each of these categories was then correlated to student achievement on reading and math assessments for fourth grade student in 2,860 elementary schools in Texas. Results from these schools

indicate that some IPPE components, especially career teacher supplements, strongly correlate to student achievement in both math and reading in the fourth grade. A key discussion point of this article was that schools with low achievement often did have very high rates of PPE. This means that had Harter only used PPE as the basis of the production-function study, there would be no correlation between PPE and student achievement. Schools' funding strategies to increase student achievement, therefore, may have abandoned these strategies, as they were reported to be ineffective.

Odden et al. (2003) developed one of the most comprehensive frameworks that breaks down PPE into expenditure components that identify instructionally related resources that may have an impact on students. Their objective in designing the framework was to develop a mainstream reporting system in which districts and even individual schools could report their respective expenditures by a specific educational strategy. The model contained seven instructionally related components (core academic teachers, specialist and elective teachers/planning and preparation, extra help, professional development, other non-classroom instructional staff, instructional materials and equipment, and student support services) and two non-instructional components (administration and operations/maintenance).

The model also included other resources and information about the school that is not typically reported in educational research. These factors were identified as "school resource indicators" and included numerous factors such as length of class, reading class size, length of instructional day, percent special education, and percent low income. Such indicators are viewed as important as they typically do correlate to expenditure. Including them in a framework when examining a school helps to give a more detailed explanation

of how money is being spent and how it may be better spent. This framework has been utilized in several empirical studies and has led to expenditure reform by several districts and states (Odden et al., 2003, 2006, forthcoming).

Assessments and Student Achievement

AMERICA 2000 through NCLB

President Ronald Reagan set the stage for national reform in education and accountability by promoting the 1983 findings of *A Nation at Risk: The Imperative for Educational Reform* (ANR). The three presidents following Reagan continued to drive the public's panic over perceived inferior public schools by passing their "education initiatives" that held schools accountable for their achievement. The AMERICA 2000 Excellence in Education Act (George H. W. Bush), AMERICA 2000 (Bill Clinton), and the No Child Left Behind Act of 2001 (George W. Bush) were each presented to the public as a method to improve the educational opportunities of students while making sure that schools were held accountable for student achievement (Swanson, 1999; "Progress of Education in the United States of America - 1990 through 1994," 1995, United States Department of Education, 1998). Local and state governments immediately believed they were losing control of their schools. The public, however, believed this accountability measure was necessary based on the rationales they were being presented (Harp, 1996; Hoff, 1997; Lawton, 1996; Sommerfield, 1996; Superfine, 2005).

The result of what has become a clear political agenda is the utilization of end-of-year high-stakes exams used to evaluate school and student achievement. The results of these exams impact every stakeholder affiliated with the school system. With federal dollars being tied tightly to school performance, the pressure is on the schools to either

achieve, or potentially lose funding—funding that many schools cannot afford to lose. As English (2002) points out, these exams have become problematic for many urban schools and have exposed an achievement gap between minority students and their majority peers. While beneficial in exposing inequity, high-stakes exams are inherently biased towards the dominant culture and those from higher socioeconomic backgrounds. Student performance, therefore, is almost predictable across the United States. Such disparities bring to the forefront of education the issue of inequity and the need for social justice in public schools.

North Carolina's Accountability: EOCs, EOGs, and ABCs

In 1996, the first round of high-stakes testing under North Carolina's accountability system took place. The name for the state's testing system was called the ABCs, where "A" stands for accountability, "B" stands for the emphasis on basic skills, and "C" stands for the control of local governments over discretionary funds. The acronym, ABCs, was carefully selected by the State Board of Education and then-Governor James Hunt to underline the purpose of the program. The ABCs movement was built upon five strategies that now drive the educational policies and implementation of these policies for the department of public instruction in this new age of accountability.

These five goals were as follows:

1. High Student Performance
2. Safe, Orderly, and Caring Schools
3. Quality Teachers, Administrators, and Staff
4. Strong Family, Community, and Business Support
5. Efficient and Effective Operations

The overall purpose of the ABCs was to require districts to take these high-stakes tests, get the results, have the districts and individual schools realign their curriculum to coincide with the state curriculum, and then force local districts to use funds to increase basic skills in areas in which the high-stakes exams showed deficiencies. While these were all truly important factors in the success of promoting the high-stakes exams in North Carolina, it was another factor—the publicizing of test results—that swayed public opinion towards accepting this accountability measure as necessary and appropriate (Groves, 2002; *NC Schools First in America 2010*, 2006).

Within this ABC model, educators would be rewarded for student performances on these standardized assessments. Schools that met “expected gains” (meaning students performed at or near predicted growth) received a \$750 bonus for each teacher in that school. If a school attained “exemplary growth” status, which meant that the school surpassed predicted growth by more than 10%, the bonus was \$1,500. While this was beneficial for a large number of high-achieving schools, the exact opposite effect was taking place at low-achieving schools (Groves, 2002; NCDPI, 2006).

At the high school level, the standardized exams are called End of Course exams (EOCs). The EOCs are standardized assessments taken at the conclusion of several high school courses. There are a total of eleven EOCs given in high school: Biology, Physical Science, Chemistry, Physics, Algebra I, Algebra II, Geometry, Civics & Economics, United States History, English I, and Occupational Course of Study (*North Carolina End-of-Course Tests*, 2008). These standardized assessments are scored based on a 1-4 scale. Students receiving a 3 or 4 are deemed “proficient” in that subject area, while those

scoring a 1 or 2 are “not proficient.” At the high school level, these exams are required to be counted as 25% of a student’s final grade in that course.

Elementary and middle schools in North Carolina also have standardized exams. At these levels, the exams are called End of Grade examinations (EOGs). Math and reading are assessed at the end of each year from Grade 3 through Grade 8. Grades 5 and 8 must also take a science EOG. Additionally, students in Grades 4, 7, and 10 are required to take a writing assessment. The 1-4 scale is used here as well to determine proficiency. Each of these assessments requires that a student answer anywhere from 75 to 95 multiple-choice questions. The questions are based on North Carolina’s Standard Course of Study (NCSCoS), which outlines the major curricula concepts that should be covered throughout the year for each of these subjects in the respective grade level.

Reading Scores and Dire Predictions

With students being tested every year starting in the third grade in North Carolina, there is one skill that can determine their overall achievement on any standardized exam: reading. Regardless of the type of assessment being taken, the End of Grade test (EOG) and the End of Course test (EOC) implicitly require that students are reading at or close to grade level. In a 20-year longitudinal study, Baydar et al. (1993) found that as early as preschool, cognitive and behavioral ability is predictive of a child’s future ability to read and that this ability to read ultimately will determine achievement, as early as elementary school. In another study, a 10-year longitudinal study was conducted by Cunningham and Stanovich (1997) in which they administered various reading tests to students in the first grade. They compared the reading test results in the first grade to those students’ achievement levels in the eleventh grade. The findings

showed that the series of reading tests given in first grade were strong predictors of student outcomes in eleventh grade. With reading ability being strongly connected to student achievement, the need to develop reading skills in the pre-elementary and early elementary school years is clearly critical for future achievement. How strong the correlation is between funding and achievement in reading is not well known, and whether increases in funds will have any impact at all is of great debate. Determining the relationship between instructional PPE (IPPE) components and reading in North Carolina will be challenging, as the research regarding this relationship in any form of student achievement is constantly debated.

Discussion

Taxes and accountability in education are two highly politically-charged topics that dominate debate in local, state, and federal governments as well constantly having the public's attention. For this reason, the expectation on school systems to be efficient and effective stewards of money is extremely high. There can be little doubt that wealthier districts have just as much accountability in terms of standardized exams as poorer districts, but the financial resources available to these very different communities are not the same. A low tax base, federal funds tied to accountability issues, and a flat-rate state funding model make poorer districts, such as those in North Carolina, very susceptible to criticism if money is not spent in a prudent and informed manner.

In addition to deciding how to spend school funds most effectively, the question of how to make sure that students have the best chance to be successful throughout their school careers becomes the challenge facing all schools. The literature suggests that students who are able to read at or above grade level have far greater academic success

than their struggling peers (Baydar, 1993; Cunningham & Stanovich, 1997). It would make sense, therefore, that districts start focusing on reading as a critical skill that must be acquired by all students at a very early age. In North Carolina, the first indicator school systems have of reading ability on a standardized exam is on the third grade reading test. Once results are in, data could be analyzed to determine what instructional strategies are effective in improving reading skills and then the district can reallocate funds that support these effective strategies.

The framework developed by Odden et al. (2003) could be a key to reforming how schools in North Carolina decide to allocate their resources. Within this framework are several identified instructional components. The *core academic teacher* (CAT) component identified in the Odden et al. model uses the salaries and fringe benefits of all full-time teachers. By utilizing this component as the basis of a study, relationships between student achievement on third grade reading EOGs and expenditure on the CAT component could be measured. Relationships that are found to be strong from district to district need to be supported and augmented with additional school funds. It may be that this requires a shift in the way districts or even the state thinks about allocating funds, but giving students across North Carolina the opportunity to be successful regardless of factors such as community socioeconomic status, average annual household income, number of parents in house, racial diversity, or educational attainment of parents must be of the utmost priority for any school district.

The information and feedback one would gain from a careful examination between the relationship between district scores on North Carolina's third grade EOG reading scores and a variation of the CAT identified by Odden et al. (2003) could make

this study the starting point for significant financial reform in the North Carolina education system.

Conceptual Framework

One of the most critical statistics used in the production-function analysis of education is per pupil expenditure (PPE). While this common education statistic has been consistently used since the release of the Coleman Report in 1966, PPE has recently been criticized for not accurately measuring the impact of various school expenditures on student achievement as measured by standardized exams (Harter, 1999; Odden et al., 2003, 2006, forthcoming). Odden et al. (2003) developed a framework that is designed to accurately determine correlations of IPPE and student achievement (2003) (See *Figure 2*). The framework for this study focused on one component of the Odden et al. model, the CAT component, and its correlation to student achievement on NCREOG for third grade (see *Figure 3*).

The first part of this model examined the strengths and weaknesses of PPE. PPE is commonly described as the “total current operating expenditures on a per pupil basis. Some examples are instructional materials, maintenance, and transportation” (*Report Card Terminology*, 2002). This definition, however, varies from state to state and sometimes from district to district. In the current framework, a rationale is given which describes the necessity of splitting the PPE statistic into two major categories: instructional components of per pupil expenditure (IPPE) and non-instructional components of per pupil expenditure (NPPE).

According to the Odden et al. (2003) model, each of these components can be further broken down into subcategories. A definition of each subcategory along with how

each has been used in previous research to show correlations to student achievement is also reviewed. Included in this analysis is an overview of Harter's (1999) model in which she examined 2,860 elementary schools in Texas to determine the impact of NPPE and IPPE on student achievement on fourth grade reading and writing exams.

The third part of the framework examines the *core academic teacher* instructional component described by Odden et al. (2003) and used in their model to show relationships to student achievement. *Core academic teacher* (CAT) cost is estimated by "multiplying the number of full-time equivalent (FTE) teachers in the expenditure element by the teachers' salary plus fringe benefits" (p. 331). Teachers at the elementary level are identified as "the licensed classroom teachers primarily responsible for teaching... in the self-contained regular education classrooms" (p. 331). Ideally, the CAT statistic would be calculated as a percentage of the total PPE. As an example, if a district's average PPE is \$5,000 and the CAT total in one school is \$2,500, the CAT statistic for that school in this framework will be fifty percent (.5). As access to North Carolina's individual teacher salary prior to the 2006-2007 school year is not available, the proposed study will calculate the CAT statistic as the sum of the salary and benefits given to the average teacher from each school district in North Carolina.

The final part of the framework is designed to determine whether or not the CAT statistic correlates to student achievement on the North Carolina Reading End of Grade (NCREOG) exam for students in the third grade. This was accomplished by collecting CAT statistics and third grade NCREOG results for every school district in North Carolina. A correlation analysis was used to examine the data to determine the strength and direction of the correlation.

CHAPTER III

METHODOLOGY

This chapter reviews the purpose of the proposed study, summarizes the conceptual framework, provides detailed information on the development of the core academic teacher statistic, and explains the methodology utilized in the conduct of the study. In addition, the methodology section within this chapter describes the rationale for utilization of site and subject selection.

Purpose

The purpose of this study was to examine the relationship between the instructional per pupil expenditure (IPPE) component, core academic teacher (CAT), and third grade student achievement on North Carolina's Reading End of Grade (NCREOG) standardized assessment. While the literature remains divided on the impact that funding has on student achievement as measured by standardized exams (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1991, 1996a, 1996b; Hedges, 1996; Laine, 1996), recent studies have taken the complex educational statistic, per pupil expenditure (PPE), and broken it into both instructional components (IPPE) and non-instructional components (NPPE) (Harter, 1999; Odden et al., 2003, 2006, forthcoming). Odden et al. (2003) identify seven key instructional components that they believe are strongly correlated to increases in student achievement on standardized assessments. Of these, the CAT component has been argued by Odden et al. (2006) to be one of the most important factors in impacting student achievement. This study will focused on a variation of the

CAT component identified by Odden et al. to determine if it does correlate to the critical skill of reading (Baydar, 1993; Cunningham & Stanovich, 1997) in North Carolina. Such an examination had yet to be conducted and has the potential to lead to major reform in public school finance.

Conceptual Framework

Production-function studies that correlate the practice of increasing expenditure of funds by schools to promote and implement programs intended on increasing student achievement on standardized exams have resulted in conflicting conclusions (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1991, 1996a, 1996b; Hedges, 1996; Laine, 1996). While per pupil expenditure (PPE) has been consistently used since the release of the Coleman Report in 1966, it has recently been criticized for not accurately measuring the impact of various school expenditures on student achievement as measured by standardized exams (Harter, 1999; Odden et al., 2003, 2006, forthcoming). Both Harter (1999) and Odden et al. (2003) break the PPE statistic into two major categories: instructional and non-instructional. Odden et al. (2003) developed a model that allows for instructional per pupil expenditure (IPPE) to be broken into smaller components. One of the components identified is *core academic teacher* (CAT), which is estimated by “multiplying the number of full-time equivalent (FTE) teachers in the expenditure element by the teachers’ salary plus fringe benefits” (p. 331). The CAT identified in the conceptual framework was utilized as an independent variable to determine if a correlation exists between it and student achievement on the North Carolina EOG standardized reading assessment for third grade on a school district basis.

Hypotheses

Major Research Hypothesis

The major research hypothesis for this study was that public school districts with a higher core academic teacher statistic would show greater student achievement on North Carolina's Reading EOG standardized assessment for third grade students than public school districts with a lower core academic teacher statistic.

Research Hypotheses

In addition to the major research hypothesis, the investigator also sought to determine if the CAT for each school district correlates with other demographic student achievement variables on North Carolina's Reading EOG standardized assessment. Such student achievement variables include:

- percent of proficient students who are economically disadvantaged,
- percent proficiency of all identified racial groups,
- percent of proficient students not economically disadvantaged,
- percent of proficient LEP students,
- percent of proficient non-LEP students,
- percent of proficient students whose parent(s) did not complete high school,
- percent of proficient students whose parent(s) graduated from high school only,
- percent of proficient students whose parent(s) graduated from high school and had some other courses,
- percent of proficient students whose parent(s) graduated from a trade or business program,
- percent of proficient students whose parent(s) completed a two-year degree or junior college,

- percent of proficient students whose parent(s) attained a four-year degree, and percent of proficient students whose parent(s) completed a graduate degree.

The null hypothesis for this study was that no statistically significant correlation would exist between the CAT and the proficiency of third grade students based on demographic variables. The alternative hypothesis was that statistically significant and positive correlations exist between the CAT and student proficiency based on these demographic variables.

Methodology

In order to examine the correlation between the CAT statistic and student achievement on the third grade NCREOG, one must first understand the derivation of the CAT statistic. Odden et al. (2003) identify the CAT as

the licensed classroom teachers primarily responsible for teaching a school's core academic subjects of reading/English/language arts, mathematics, science, and history/social studies. In elementary schools, core academic teachers consist of the teachers in the self-contained regular education classrooms. (p. 331)

Once identified, the researcher must then develop the statistic for the CAT. To do this, this study developed a derivation of the Odden et al. CAT statistic by combining the average salary and average fringe benefit package provided to teachers in each of the 115 school districts in North Carolina. The information needed to calculate this statistic is provided by the Financial and Business Services Division of the Public Schools of North Carolina on an annual basis. This

information was acquired from all North Carolina school districts for the 2005-2006 academic year.

Following the acquisition of this information, data on the total number of students being tested, the total percentage of students who passed the third grade NCREOG, and the PPE for each district was obtained. Further, demographic statistics such as gender, race, socioeconomic status, parental educational attainment, and limited English proficiency (LEP) status was collected for those students who demonstrate proficiency on the third grade NCREOG. These statistics were acquired from the North Carolina Accountability Services Division, as they were posted on its website for every public school in North Carolina.

The PPE for each school district in North Carolina was obtained from an annual publication by North Carolina Public Schools called *North Carolina Public Schools Statistical Profile*. The profile that was utilized for this study was the 2007 profile. Within this profile, there exists two different PPE statistics: “Per Pupil Expenditure Ranking (Child Nutrition Included)” (p. 52) or “Per Pupil Expenditure Ranking (Child Nutrition Excluded)” (p 55). This study will utilize the “Per Pupil Expenditure Ranking (Child Nutrition Included).”

Ideally, the CAT would be expressed as a percentage using data from the above resource for each school district. Such an option, however, was not possible, as individual teacher salary information was no longer available on a district basis for the 2005-2006 school year (records were reportedly purged to prepare for a new statewide financial accounting program). Were it possible, the following equation would be ideal in calculating the CAT for individual schools:

$$\text{CAT} = \frac{\text{FTE} * (\text{Average 3}^{\text{rd}} \text{ Grade Teacher Salary} + \text{Average 3}^{\text{rd}} \text{ Grade Teacher Benefits})}{\text{Total Students Tested} * \text{PPE}}$$

This CAT statistic would be specifically for third grade teachers rather than the average teacher in the county.

The CAT statistic that was used in this study was developed for every North Carolina school district. The CAT used 2005-2006 financial information and was calculated using the following formula:

$$\text{CAT} = \sum(\text{TS}, \text{SU}, \text{LI}, \text{RE}, \text{SS}, \text{HI})$$

In this formula, TS is the average teacher salary; SU is the average supplement, LI is the average liability insurance, RE is the average retirement, SS is the average social security, and HI is the average hospitalization paid by each school district. The CAT statistic for each identified district will then be loaded into *SPSS Base 16.0 for Windows* (SPSS) as the independent variable.

An additional variable was calculated, PPE without the influence of CAT, called “PPE minus CAT,” though it was not calculated as a simple difference. Instead, a regression was run with PPE as the dependent variable and CAT as the independent variable. The residuals from that regression are the part of PPE that is not influenced by CAT; hence, these residuals were used as the PPE minus CAT values.

The results of the 2005-2006 third grade NCREOG were acquired for each of the identified school districts. This information was expressed as a proficiency

percentage for the identified schools. That is, the proficiency is equal to the number of student scoring a 3 or a 4 (therefore being identified as proficient) divided by the total number of students taking the third grade NCREOG. Thus, the achievement of each school district will be calculated in the following way:

$$\text{Achievement} = \frac{\text{Students scoring a 3 or 4}}{\text{Total number of students}}$$

The achievement statistic for each identified school district was also loaded into SPSS as the dependent variable. A correlation between these independent and dependent variables was then run for the identified school districts.

Other dependent variables were added to SPSS. They are third grade student achievement broken down by gender, race, SES, limited English proficiency (LEP) status, and parental educational attainment. The independent variables CAT, PPE, and PPE minus CAT may influence these more specific measures differently from the overall achievement measure.

Site Selection & Participants

Access & Steps to Acquire Sample Size

On an annual basis, North Carolina Public Schools releases to the public the results of all high-stakes achievement assessments. Achievement information is placed into a database which enables users of the database to disaggregate data based on school year, type of assessment, school district, school, and grade level. This database is found on North Carolina's Accountability Services Division website. The results of the third grade Reading EOG were collected for each school district. Additionally, the financial data needed to calculate the CAT was also collected for every school district. The

methodology utilized in this study follows the model and framework developed by Odden et al. (2003) and implemented by Odden et al. (2006, forthcoming) to identify how strongly various IPPE components correlate to student achievement on standardized assessments.

Rationale, Population, and Sample Size

The study used a modified version of the Odden et al. (2003) model in which data was collected from all 115 school districts, or local educational agencies (LEAs), in North Carolina. A framework such as that provided by Hartmann (1999), in which schools were categorized into three different levels based on their PPE (low, medium, high), would have been ideal had this study been able to collect individual teacher financial data. As this study worked with district data, collecting the above-mentioned financial and statistical information about each LEA in North Carolina allowed a general analysis to be conducted. While individual schools would have been ideal, it is the school district that ultimately distributes to its individual schools. As such, knowing if the CAT does correlate strongly to student achievement on the third grade NCREOG may impact on how district funds are distributed to individual schools.

Procedures

The data necessary to conduct this study consisted of both third grade NCREOG results from each school district, as well as the development of the CAT statistic. The EOG achievement data for this study was the dependent variable. It was collected for 2005-2006 NCREOG assessment from the North Carolina Public Schools website. The CAT, gender, race, SES, LEP status, and parental educational levels were the independent variables for each school district. The CAT was calculated as described in

the “Methodology” section of this chapter. In order to determine the CAT, the average salary of each teacher plus any fringe benefits for these teachers were added together for each school district. The total PPE identified by NCSP 2007 is expressed as either “Per Pupil Expenditure Ranking (Child Nutrition Included)” (p. 45) or “Per Pupil Expenditure Ranking (Child Nutrition Excluded)” (p 48). This study utilized the “Per Pupil Expenditure Ranking (Child Nutrition Included).” It is important to note that should the “Child Nutrition Excluded” PPE statistic be used, the identified public school districts would remain similarly ranked.

Rationale for use of Quantitative Methods

Quantitative data is utilized when a study has clearly defined variables; when analyses and methods of data collection are both objective; and when the study needs to be replicated by other researchers in order to affirm or contradict the findings of the study (Gage, 1994). This study examined student output in the form of standardized test scores as well as the CAT statistic, which is also a numerical figure. In attempting to determine the correlation between the two, the appropriate method used to examine this data is quantitative methods, as a quantitative approach enables researchers to analyze numerical data using various statistical measures.

Several studies examining the relationship between various components of school resources and student achievement have utilized quantitative methods to examine the relationship. Harter (1999) conducted an investigation of 2,860 elementary schools in Texas in which relationships between instructional components and non-instructional components of PPE were compared to student achievement on reading and math assessments for fourth grade students. Hartman (1999) used student achievement data

from the 1993 -1994 school year and correlated that data to the 50 highest-, 50 middle-, and 50 lowest-spending districts in Pennsylvania to determine if PPE impacted student achievement. Odden et al. (2003) developed a model that contains seven instructionally related components (core academic teachers, specialist and elective teachers/planning and preparation, extra help, professional development, other non-classroom instructional staff, instructional materials and equipment, and student support services) and two non-instructional components (administration and operations/maintenance). Each of these components necessitates the use of data that is both objective and numerical. This model was used to determine correlations of student achievements to these variables in both Arkansas (Odden et al., 2006) and Wyoming (Odden et al., forthcoming).

Analysis

Statistical Procedures

The data collected in the procedure were loaded into *SPSS Base 16.0 for Windows* (SPSS). The CAT statistic coming from each of the obtained schools was loaded into SPSS under the heading “CAT” and utilized as the independent variable, as this study aims to show how CAT influences student achievement. The third grade NCREOG results for each of the identified schools were also loaded into SPSS under the heading “Achievement” and were utilized as the dependent variable, as this study aims to show how this variable is influenced by the CAT variable. Additionally, the following will be loaded into SPSS as additional independent variables:

- The total students taking the third grade NCREOG,
- percent of proficient students who are economically disadvantaged,
- percent proficiency of all identified racial groups,

- percent of proficient students not economically disadvantaged,
- percent of proficient LEP students,
- percent of proficient non-LEP students, percent of proficient students whose parent(s) did not complete high school,
- percent of proficient students whose parent(s) graduated from high school only,
- percent of proficient students whose parent(s) graduated from high school and had some other courses,
- percent of proficient students whose parent(s) graduated from a trade or business program,
- percent of proficient students whose parent(s) completed a two-year degree or junior college,
- percent of proficient students whose parent(s) attained a four-year degree, and
- percent of proficient students whose parent(s) completed a graduate degree.

A simple correlation (bivariate correlation) was run on the NCREOG and CAT data to develop a Pearson correlation coefficient, r . The coefficient that was produced from this analysis determined the strength and direction of the relationship between the two variables. Correlations were identified as “small” if the coefficient measured between -0.1 and -0.3 or between 0.1 and 0.3. “Medium correlations” were identified if the coefficient measured between -0.3 and -0.5 or between 0.3 and 0.5. A “high correlation” was identified if the coefficient measured between -0.5 and -1.0 or between 0.5 and 1.0 (Field, 2005).

Rationale

This statistical analysis was utilized as a simple correlation enables the researcher to determine causation between two variables. While a correlation coefficient is the result of the analysis, the strength and direction of the coefficient should only be interpreted to mean that there is, or is not, a relationship between the two variables, that the relationship is either positive or negative, and that the relationship between the two variables is strong, medium, or small.

Reliability and Validity

The data utilized for this study is published on the website for North Carolina Public Schools Accountability Services Division (NCPSASD) of the North Carolina Department of Public Instruction located in Raleigh, North Carolina. The reliability and validity of the data used in this study is based on the integrity of the data collection process from each individual school, to the district office, and then to the North Carolina Department of Public Instruction (NCDPI). In each district across North Carolina, the process for submitting the data from school, to the district office, and then to the state is the same. Every district undergoes a “check data process” where school and testing officials for each district examine answer sheets to be sure that all information (name, gender, student identification number, etc.) is filled in correctly and that there are no stray marks on the answer sheet that would cause a misread by the scanner. Testing officials from the district then scan the answer sheets and upload the data through a “secure shell” which requires a unique username and password for each county. NCDPI then validates the scores if there are no errors. Following this step, NCDPI is able to create individual student reports for each test a student has taken (A. Cheek, personal communication, February 17, 2009). All of the results are then uploaded onto the NCPSASD website.

Significance

School systems are one of the largest expenditures of state and local funds (Thompson & Wood, 2005). Just over 40% of local funds and almost 50% of state funds go towards funding public schools in North Carolina. With such a large amount of money being given to schools, proper stewardship of these funds is critical. Along with the increase in funds comes an increased expectation by the public for greater levels of student achievement. Both Baydar et al. (1993) and Cunningham and Stanovich (1997) have shown that student achievement on standardized assessments is directly related to a student's reading ability. It would seem, then, that a prudent steward of public school funds should be vitally interested in determining how funds spent could or would be related to impacting students' ability to read.

In addition to examining the question of whether or not CAT is positively correlated to third grade student achievement on the NCREOG, the findings of this study could address the issue of the PPE and student achievement issue. Coleman et al. (1966) and Hanushek (1981, 1986, 1991, 1996a, 1996b) have argued that their studies indicate that PPE does not increase student achievement. Conversely, Greenwald et al. (1994, 1996a, 1996b) have argued that the results of their studies show that PPE does impact student achievement. Finally, Odden et al. (2003, 2006, forthcoming) have argued that it is not PPE at all, but CAT that will improve student achievement. Hanushek (2007), however, argued that Odden and his associate, Lawrence Picus, have essentially developed a model that serves their own financial well-being and does not address the needs of the very school districts for which they work. Hanushek argues that their model is yet another example of researchers mishandling public money in a futile attempt to

increase student achievement. The results of this study certainly could support the arguments of one of these philosophies.

While this study is limited in terms of using average salaries rather than individual teacher salaries, the results may be quite significant in terms of fostering school finance reform. If significant relationships are found within the sampling units specified, the study may become the leverage for school leaders within the state to reexamine current expenditure structures in such a way as to maximize student achievement.

CHAPTER IV

FINDINGS

The major research hypothesis for this study was that public school districts with a higher core academic teacher (CAT) statistic will show greater student achievement on North Carolina's Reading EOG for third grade students than public schools districts with a lower core academic teacher statistic.

In addition to the major research hypothesis, this study also investigated if the CAT and PPE for each school district correlated with other demographic student achievement variables on the third grade NCREOG. These student achievement variables include:

- percent of proficient students who are economically disadvantaged,
- percent proficiency of all identified racial groups,
- percent of proficient students not economically disadvantaged,
- percent of proficient LEP students,
- percent of proficient non-LEP students, percent of proficient students whose parent(s) did not complete high school,
- percent of proficient students whose parent(s) graduated from high school only,
- percent of proficient students whose parent(s) graduated from high school and had some other courses,
- percent of proficient students whose parent(s) graduated from a trade or business program,

- percent of proficient students whose parent(s) completed a two-year degree or junior college,
- percent of proficient students whose parent(s) attained a four-year degree, and
- percent of proficient students whose parent(s) completed a graduate degree.

percent of proficient students who are economically and non-economically disadvantaged, percent proficiency of all identified racial groups, percent of proficient students by gender, percent of proficient LEP and non-LEP students, percent of proficient students whose parent(s) did not complete high school, percent of proficient students whose parent(s) graduated from high school only, percent of proficient students whose parent(s) graduated from high school and had some other courses, percent of proficient students whose parent(s) graduated from a trade or business program, percent of proficient students whose parent(s) completed a two-year degree or junior college, percent of proficient students whose parent(s) attained a four-year degree, and percent of proficient students whose parent(s) completed a graduate degree. The null hypothesis for this study was that no statistically significant correlation exist between the CAT or PPE and these demographically classified variables. The alternative hypothesis was that statistically significant and positive correlations do exist between the CAT and PPE with these demographic variables.

Following the model developed by Odden et al. (2003), this study isolated the instructional component of per pupil expenditure (IPPE), core academic teacher (CAT), to determine if a relationship exists between CAT and student achievement on the third grade North Carolina Reading End of Grade exam (NCREOG). The Odden et al. model is based on the belief that the seven IPPE it identifies are the most critical in predicting

student achievement on standardized assessments. Additionally, this study also isolated the statistic per pupil expenditure (PPE) to determine if it is instrumental in predicting student achievement on standardized assessments.

After the analysis of CAT and PPE on the various dependent variables, a new independent variable, PPE minus CAT, was developed to show the full impact of PPE on the dependent variables. The reason for including this variable was that the statistic CAT includes all of the teacher salaries and other benefits. According to Hanushek (1986), teachers' salaries alone account for approximately two thirds of a district's educational spending. As such, CAT, by its very definition, represents a large percentage of the PPE. By utilizing a linear regression, this new independent variable was developed to show the impact of PPE without the inclusion of CAT in PPE (PPE minus CAT).

This chapter provides the results of the analyzed data which address the above hypotheses. This chapter first addresses the analysis involving the major research hypothesis, followed by an analysis of each secondary hypothesis. A summary of all significant data from this data is located at the end of the chapter.

Results of Data Analysis

Correlation of the Independent Variables

Table 1 shows how the independent variables correlate with each other. There is a strong correlation between PPE and PPE minus CAT ($r = .905$, significant at the 0.01 level). This positive, strong, and significant correlation indicates that the variables PPE and PPE minus CAT are strongly related to each other. The other significant correlation seen in Table 1 is between CAT and PPE ($r = .426$, significant at the 0.01 level). This indicates that CAT and PPE are moderately related to each other. That PPE minus CAT is

not at all related to CAT makes perfect sense: The variable PPE minus CAT purposely removed the entire influence of CAT from the PPE variable.

Table 1: Correlation of the independent variables to each other

		Core Academic Teacher	Per Pupil Expenditure
Core Academic Teacher	Pearson Correlation	1	.426**
	Sig. (2-tailed)		.000
	N	115	115
Per Pupil Expenditure	Pearson Correlation	.426**	1
	Sig. (2-tailed)	.000	
	N	115	115
PPE minus CAT	Pearson Correlation	.000	.905**
	Sig. (2-tailed)	1.000	.000
	N	115	115

** . Correlation is significant at the 0.01 level (2-tailed).

Correlation of PPE and CAT to NCREOG Scores

The average CAT, PPE, and third grade NCREOG scores were collected from all school districts in North Carolina (N = 115). The data was analyzed and results were compiled into Table 2.

As seen in Table 2, CAT was positively correlated to third grade NCREOG scores ($r = .304$, significant at the 0.01 level). Conversely, PPE was negatively correlated ($r = -.215$, significant at the 0.05 level). When the influence of CAT was removed from PPE, the negative correlation grew ($r = -.382$, significant at the 0.01 level). The $r = .304$ and $r = -.382$ correlations are considered to be a medium correlation, while the $r = -.215$

correlation is considered to be a small correlation (Field, 2005). This finding indicates that higher district CAT scores are significant predictors of higher student achievement on the third grade NCREOG. An increase in PPE, however, results in a decrease in district proficiency on the third grade NCREOG. The negative correlation grows for PPE when the influence of CAT is removed (from $r = -.215$, significant at the 0.05 level to $r = -.382$, significant at the 0.01 level).

Table 2: Correlations of PPE and CAT to District Achievement on third grade NCREOG

		Total LEA Proficiency on third grade NCREOG
Core Academic Teacher	Pearson Correlation	.304**
	Sig. (2-tailed)	.001
	N	115
Per Pupil Expenditure	Pearson Correlation	-.215*
	Sig. (2-tailed)	.021
	N	115
PPE minus CAT influence	Pearson Correlation	-.382**
	Sig. (2-tailed)	.000
	N	115

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Correlation of CAT, PPE, and PPE minus CAT to Gender Achievement on NCREOG

Data on the proficiency of males and females on the third grade NCREOG was also collected from each school district in North Carolina (N = 115) and analyzed to

determine if a significant correlation resulted between gender and PPE, CAT, or PPE minus CAT. The results of the analysis are shown in Table 3.

Table 3: Correlations CAT, PPE, and PPE minus CAT to Gender Achievement on third grade NCREOG

		Female Proficiency for LEA on third grade NCREOG	Male Proficiency for LEA on third grade NCREOG
Core Academic Teacher	Pearson Correlation	.290**	.272**
	Sig. (2-tailed)	.002	.003
	N	115	115
Per Pupil Expenditure	Pearson Correlation	-.023	-.332**
	Sig. (2-tailed)	.808	.000
	N	115	115
PPE minus CAT influence	Pearson Correlation	-.162	-.495**
	Sig. (2-tailed)	.084	.000
	N	115	115

** . Correlation is significant at the 0.01 level (2-tailed).

Table 3 reveals a positive correlation existing between CAT and third grade female and male student achievement on the NCREOG that is significant at the 0.01 level ($r = .290$, $r = .272$, respectively). This relationship would be identified as a small, significant relationship indicating that the higher the CAT, the higher the rate of proficiency for third grade female and male students on the NCREOG. The relationship of PPE to gender was significant and negatively correlated to male achievement on the third grade NCREOG ($r = -.332$, significant at the 0.01 level). When the influence of CAT was removed from PPE, this negative correlation grew in magnitude ($r = -.495$,

significant at the 0.01 level). This relationship is identified as a medium, significant relationship indicating that the higher the PPE, the lower the rate of proficiency for third grade male students on the NCREOG. One trend seen again in Table 3 is that the significant correlations for PPE were negatively correlated, while the significant correlations for CAT were positively correlated. This was the same trend seen in Table 2.

Correlation of CAT, PPE, and PPE minus CAT to Racial Achievement on Third Grade NCREOG

Data on student achievement on the third grade NCREOG based on race was collected from each of the North Carolina school districts (N = 115). This information was then analyzed to determine if CAT, PPE, or PPE minus CAT showed any significant correlation to student achievement based on race. The results can be seen in Table 4.

Table 4 reveals four significantly correlated relationships. The analysis shows that CAT is correlated to the achievement of third grade black students (N = 102) on the NCREOG ($r = .202$, significant at the 0.05 level). CAT was also positively correlated to the achievement of third grade white students (N = 114) on the NCREOG ($r = .287$, significant at the 0.01 level). Both of these relationships are small, significant correlations that indicate that the higher the CAT, the higher the rates of proficiency on the NCREOG for third grade black and white students. PPE did not show any significant correlations until the CAT influence was removed. PPE minus CAT shows a negative, significant correlation with black students ($r = -.283$, significant at the 0.01 level) and with white students ($r = -.201$, significant at the 0.05 level). This indicates that when the influence of CAT on PPE is removed, higher PPE levels will result in lower district proficiency for third grade black and white students on the NCREOG. One can again see the significant,

positive correlation trend between CAT and the dependent variables in Table 2 through Table 4 while the negative, significant relationship trend seen in those same tables exists again between PPE minus CAT and the dependent variables.

Table 4: Correlations of CAT, PPE, and PPE minus CAT to Proficiency by Race

		American Indian Proficiency for LEA on third grade NCREOG	Asian Proficiency for LEA on third grade NCREOG	Black Proficiency for LEA on third grade NCREOG	Hispanic Proficiency for LEA on third grade NCREOG	Multi-racial Proficiency for LEA on third grade NCREOG	White Proficiency for LEA on third grade NCREOG
Core Academic Teacher	Pearson Correlation	.051	.153	.202*	.023	.120	.287**
	Sig. (2-tailed)	.776	.273	.041	.821	.271	.002
	N	34	53	102	98	86	114
Per Pupil Expenditure	Pearson Correlation	-.033	.013	-.173	.121	-.020	-.054
	Sig. (2-tailed)	.852	.929	.082	.234	.856	.567
	N	34	53	102	98	86	114
PPE minus CAT influence	Pearson Correlation	-.057	-.110	-.283**	.127	-.111	-.201*
	Sig. (2-tailed)	.749	.433	.004	.214	.311	.032
	N	34	53	102	98	86	114

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Correlation of CAT, PPE, and PPE minus CAT to Socioeconomic Status on the NCREOG

The North Carolina Department of Public Instruction has identified students as either being economically disadvantaged or non-economically disadvantaged on the 2005-2006 third grade NCREOG. The data on PPE, CAT, proficiency of economically disadvantaged, and proficiency of non-economically disadvantaged students were collected from each of the North Carolina school districts (N = 115). The results of this analysis can be seen in Table 5.

Table 5: Correlations of PPE and CAT to Socioeconomic Status

		LEA Proficiency for Economically Disadvantaged Students on the third grade NCREOG	LEA Proficiency for Non-Economically Disadvantaged Students on the third grade NCREOG
Core Academic Teacher	Pearson Correlation	.187*	.260**
	Sig. (2-tailed)	.046	.005
	N	115	115
Per Pupil Expenditure	Pearson Correlation	-.017	-.285**
	Sig. (2-tailed)	.855	.002
	N	115	115
PPE minus CAT influence	Pearson Correlation	-.107	-.437**
	Sig. (2-tailed)	.254	.000
	N	115	115

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The results in Table 5 reveal four significant correlations. First, a positive correlation exists between CAT and the proficiency of economically disadvantaged third

grade students on the NCREOG ($r = .187$, significant at the .001 level). CAT is also significantly and positively correlated to the proficiency of non-economically disadvantaged third grade students on the NCREOG ($r = .260$, significant at the 0.05 level). These two significant, positive correlations indicate that the higher the CAT, the higher rate of proficiency for third grade students identified as economically and non-economically disadvantaged. PPE shows a significant, negative correlation with the proficiency of non-economically disadvantaged third grade students on the NCREOG ($r = .260$, significant at the 0.05 level) which indicates that the higher the PPE, the lower the rate of proficiency for non-economically disadvantaged third grade students on the NCREOG. When the influence of CAT is removed from PPE, a stronger, significant, negative correlation exists between PPE and non-economically disadvantaged students ($r = -.437$, significant at the 0.01 level). This indicates that the higher the PPE without the influence of CAT, the lower the proficiency on the NCREOG for non-economically disadvantaged third grade students. As with Table 2 through Table 4, Table 5 also reveals positive correlations between CAT and the dependent variables, while significant correlations between both PPE and PPE minus CAT with the dependent variables continue to be negative.

Correlation of CAT, PPE, and PPE minus CAT to LEP Status on the NCREOG

Another correlation run was that between CAT, PPE, and PPE minus CAT to the proficiency of both limited English proficient (LEP) and non-limited English proficient (non-LEP) third grade students on the NCREOG. Data were collected for all North Carolina school districts ($N = 115$) for each of these variables. There were 92 school districts in North Carolina ($N = 92$) reporting data for LEP student proficiency, while all

Table 6: Correlations of CAT, PPE, and PPE minus CAT to LEP Status

		LEA Proficiency for LEP on the third grade NCREOG	LEA Proficiency for Non- LEP on the third grade NCREOG
Core Academic Teacher	Pearson Correlation	.068	.286**
	Sig. (2-tailed)	.522	.002
	N	92	115
Per Pupil Expenditure	Pearson Correlation	.130	-.272**
	Sig. (2-tailed)	.217	.003
	N	92	115
PPE minus CAT influence	Pearson Correlation	.116	-.435**
	Sig. (2-tailed)	.270	.000
	N	92	115

** . Correlation is significant at the 0.01 level (2-tailed).

The results in Table 6 reveal three significant relationships, all dealing with students identified as being non-LEP. The first significant relationship is the positive correlation between CAT and the proficiency of non-LEP third grade students on the NCREOG ($r = .286$, significant at the 0.01 level). This indicates that the higher the CAT, the higher the rates of proficiency for non-LEP third grade students on the NCREOG. The second significant relationship is the negative correlation between PPE and the proficiency of non-LEP third grade students on the NCREOG ($r = -.272$, significant at the 0.01 level). When the influence of CAT is removed from PPE, the negative correlation increases in magnitude (from $r = -.272$ to $r = -.435$, both significant at the 0.01 level). This relationship indicates that the higher the PPE, the lower the rate of proficiency for non-LEP third grade students on the NCREOG, a relationship that

strengthens in the negative direction when the influence of CAT is removed. The results shown in Table 6 continue to show the positive, significant relationship trend seen in the previous analyses (Table 2 through Table 5) between CAT and the various dependent variables, while also revealing the negative, significant relationships with PPE and PPE minus CAT with the various dependent variables.

Correlation of CAT, PPE, and PPE minus CAT to parental academic achievement

The final analysis conducted involved examining the relationship between CAT, PPE, and PPE minus CAT to third grade student proficiency based on the academic attainment of students' parents. Data for PPE and CAT was collected from each of the North Carolina school districts (N = 115), and the proficiency of students whose parents fell into the following levels of academic attainment were also collected: parents did not complete high school (N = 109), parents completed high school only (N = 115), parents completed high school and also took some additional courses (N = 111), parents completed a trade or business associates program (N = 58), parents completed junior college or a community college program (N = 113), parents completed a four-year degree (N = 112), and parents completed a graduate degree (N = 95). The results of the analysis can be seen in Table 7.

Table 7 reveals eight significant relationships. The first significant relationship is a positive correlation between CAT and third grade student proficiency rates for students whose parents completed a graduate degree ($r = .220$, significant at the 0.05 level). This indicates that the higher the CAT, the higher the rate of proficiency on the NCREOG for third grade students whose parents have completed a graduate degree.

Table 7: Correlations of CAT, PPE, and PPE minus CAT to Parental Educational Attainment

		Parents did not complete high school	Parents completed high school only	Parents completed high school and some courses	Parents completed a trade or business associates program	Parents completed a community college or junior college program	Parents completed a 4-year degree	Parents completed a graduate degree
Core Academic Teacher	Pearson Correlation	.068	.150	.106	-.130	.146	.087	.220*
	Sig. (2-tailed)	.483	.111	.270	.332	.122	.362	.032
	N	109	115	111	58	113	112	95
Per Pupil Expenditure	Pearson Correlation	-.102	-.137	-.230*	-.199	-.142	-.245**	-.130
	Sig. (2-tailed)	.291	.145	.015	.134	.132	.009	.210
	N	109	115	111	58	113	112	95
PPE minus CAT influence	Pearson Correlation	-.146	-.222*	-.311**	-.152	-.241*	-.315**	-.304**
	Sig. (2-tailed)	.129	.017	.001	.256	.010	.001	.003
	N	109	115	111	58	113	112	95

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The next two significant relationships are negative correlations between PPE and third grade proficiency rates on the NCREOG for students whose parents completed high

school and some additional courses ($r = -.230$, significant at the 0.05 level), and for students whose parents completed a four-year degree ($r = -.245$, significant at the 0.01 level). Both of these relationships indicate that the higher the PPE, the lower the rate of proficiency on the NCREOG for third grade students whose parents have completed high school and some additional courses and for third grade students whose parents completed a four-year degree. The remaining five significant, negative relationships occur when the influence of CAT is removed from PPE. When that influence is removed, third grade students whose parents completed high school only ($r = -.222$, significant at the 0.05 level), completed high school and some courses ($r = -.311$, significant at the 0.01 level), completed junior college or a community college program ($r = -.241$, significant at the 0.05 level), completed a four-year degree ($r = -.315$, significant at the 0.01 level), or completed a graduate degree ($r = -.304$, significant at the 0.01 level) increases in magnitude in the negative direction. This indicates that the higher the PPE minus CAT influence, the lower the proficiency rates for third grade students whose parents have attained each of the following academic levels: high school only, high school and some additional courses, junior college or a community college program, a four-year degree, or a graduate degree. As seen in Table 2 through Table 6, the results in Table 7 show the continuing trend of significant CAT relationships to the dependent variables being positively correlated, while the significant relationships for both PPE and PPE minus the CAT to the dependent variables continue to be negative.

Summary of Data

Data collected for this study was analyzed and placed into Table 2 through Table 7 to show how CAT, PPE, and PPE minus CAT correlated to the various categories of dependent variables. Table 8 was created to give the reader a summary of all correlations that were found to be significant during this analysis.

As seen in Table 8, 17 out of the 26 significantly correlated relationships would be considered small correlation relationship, based on the fact that these coefficients fell between -0.1 and -0.3 or between 0.1 and 0.3 (Field, 2005). In addition, 9 out of the 26 significantly correlated relationships would be considered medium correlations, as they fell between -0.3 and -0.5 or between 0.3 and 0.5 (Field, 2005).

In summarizing all of the significant correlations that existed when the data was analyzed, Table 8 also reveals the fact that all significant PPE correlations to the dependent variables (total LEA proficiency on the third grade NCREOG, LEA proficiency for third grade males on the NCREOG, LEA proficiency for non-economically disadvantaged students on the third grade NCREOG, LEA proficiency for third grade non-LEP students on the NCREOG, the LEA proficiency of third grade students whose parents completed high school and some courses, and the LEA proficiency of third grade students whose parents completed a four-year degree) were negatively correlated. When the influence of CAT was removed from PPE, the number of significant, negative correlations increased from 6 to 11 (adding the LEA proficiency for black and white third grade students on the NCREOG, the LEA proficiency of third grade students on the NCREOG whose parents completed high school only, the LEA proficiency of third grade students whose parents completed junior college or a

community college program, and the LEA proficiency of students whose parents completed a graduate degree), while also increasing in magnitude. These results indicate that increasing the PPE or PPE minus the influence of CAT results in a decrease in the LEA proficiency for third grade students on the NCREOG in each of these dependent variable categories.

Table 8: A summary of all significant correlations of CAT, PPE, and PPE minus CAT to various dependent variables.

		Core Academic Teacher	Per Pupil Expenditure	PPE minus CAT
Total Proficiency for LEA on third grade NCREOG	Pearson Correlation	.304**	-.215*	-.382**
	Sig. (2-tailed)	.001	.021	.000
	N	115	115	115
Female Proficiency for LEA on third grade NCREOG	Pearson Correlation	.290**		
	Sig. (2-tailed)	.002		
	N	115		
Male Proficiency for LEA on third grade NCREOG	Pearson Correlation	.272**	-.332**	-.495**
	Sig. (2-tailed)	.003	.000	.000
	N	115	115	115
Black Proficiency for LEA on third grade NCREOG	Pearson Correlation	.202*		-.283**
	Sig. (2-tailed)	.041		.004
	N	102		102
White Proficiency for LEA on third grade NCREOG	Pearson Correlation	.287**		-.201*
	Sig. (2-tailed)	.002		.032
	N	114		114
LEA Proficiency for Economically Disadvantaged Students on third grade NCREOG	Pearson Correlation	.187*		
	Sig. (2-tailed)	.046		
	N	115		

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 8 (continued): A summary of all significant correlations of CAT, PPE, and PPE minus CAT to various dependent variables.

		Core Academic Teacher	Per Pupil Expenditure	PPE minus CAT
LEA Proficiency for Non-Economically Disadvantaged Students on third grade NCREOG	Pearson Correlation	.260**	-.285**	-.437**
	Sig. (2-tailed)	.005	.002	.000
	N	115	115	115
LEA Proficiency for Non-LEP on third grade NCREOG	Pearson Correlation	.286**	-.272**	-.435**
	Sig. (2-tailed)	.002	.003	.000
	N	115	115	115
LEA Proficiency of Students whose parents completed high school only	Pearson Correlation			-.222*
	Sig. (2-tailed)			.017
	N			115
Parents completed high school and some courses	Pearson Correlation		-.230*	-.311**
	Sig. (2-tailed)		.015	.001
	N		111	111
Proficiency of Students whose Parents completed a community college or junior college program	Pearson Correlation			-.241*
	Sig. (2-tailed)			.010
	N			113
Parents completed a 4-year degree	Pearson Correlation		-.245**	-.315**
	Sig. (2-tailed)		.009	.001
	N		112	112
Parents completed a graduate degree	Pearson Correlation	.220*		-.304**
	Sig. (2-tailed)	.032		.003
	N	95		95

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Conversely, Table 8 also reveals that all significant CAT correlations to the dependent variables (total LEA proficiency on the third grade NCREOG, female proficiency for LEA on third grade NCREOG, proficiency of black students for LEA on

third grade NCREOG, proficiency of white students for LEA on third grade NCREOG, LEA proficiency for economically disadvantaged students on the third grade NCREOG, LEA proficiency for non-economically disadvantaged students on the third grade NCREOG, LEA proficiency for non-LEP students on the third grade NCREOG, and the LEA proficiency of students whose parents completed a graduate degree) were all positively correlated. This indicates that as CAT increases, the rate of proficiency for each of these variables would likely increase.

In an attempt to show the extent to which CAT, PPE, and PPE minus CAT were positively and negatively correlated to each of the dependent variables, Table 9 was created.

Table 9: A summary of the total positive and negative significant PPE, CAT, and PPE minus CAT relationships when compared to every dependent variable examined in the study. The total number of dependent variables utilized was 20.

	Percent Significant and Positive Correlations	Percent of Significant and Negative Correlations
Core Academic Teacher	45.0%	0%
Per Pupil Expenditure	0%	30.0%
PPE minus CAT influence	0%	55.0%

As seen in Table 9, 45% of the possible correlations between CAT and all of the dependent variables were positive. None of the relationships between CAT and any of the dependent variables were significant and negative. PPE was significantly and negatively correlated to 30% of all possible dependent variables. When the influence of CAT was removed from PPE, the number of correlations increased from 35% to 55%. In summary, CAT produced only positive correlations when the relationships were significant, while

both PPE and PPE minus CAT produced only negative correlations when the relationships were significant.

Summary of Results as Related to the Major, Null, and Alternative Research Hypotheses

This section examines how the results of the data analysis matched up to the major research hypothesis and the alternative research hypotheses, which were the following:

- Major Research Hypothesis: Public school districts (or local education agencies, LEAs) with a higher core academic teacher statistic will show greater student achievement on North Carolina's Reading EOG standardized assessment for third grade students than public schools districts with a lower core academic teacher statistic.
- Null Hypothesis: No statistically significant correlation will exist between the CAT and third grade student proficiency on the NCREOG based on various demographic variables (gender, race, SES status, LEP status, and educational attainment of a student's parents).
- Alternative Hypothesis: The alternative hypothesis is that statistically significant and positive correlations exist between the CAT and third grade student proficiency on the NCREOG, based on demographic variables (gender, race, SES status, LEP status, and educational attainment of a student's parents).

The major research hypothesis was based on the model of Odden et al. (2003) which identified seven key IPPE components that impact student achievement on standardized assessments. Of these seven, CAT is identified as one of the major

predictors of student achievement on standardized assessments. In addition to the Odden et al. model, PPE and PPE minus CAT were also included as independent variables in this analysis to determine if Hanushek's claim (1981, 1986, 1989, 1991, 1994, 1996a, 1996b) that PPE does not correlate with student achievement would be supported for North Carolina school districts. Hanushek also made the claim that the models of Odden et al. are financially self-serving for the researchers and that the increase in spending will not impact student achievement (2007). These are the findings from the results:

- CAT was significantly and positively correlated to total LEA proficiency for third grade student achievement on the NCREOG ($r = .304$, significant at the 0.01 level).
- PPE was significantly and negatively correlated to total LEA proficiency for third grade student achievement on the NCREOG ($r = -.215$, significant at the 0.05 level).
- PPE minus CAT was significantly and negatively correlated to total LEA proficiency for third grade student achievement on the NCREOG ($r = -.382$, significant at the 0.01 level).

The null and alternative hypotheses utilize a breakdown of third grade student proficiencies based on various demographic data (gender, race, SES status, LEP status, and educational attainment of a student's parents). The relationships of CAT, PPE, and PPE minus CAT to these demographic categories for the proficiency of third grade students on the NCREOG were analyzed. These are the findings from the results:

- CAT was positively and significantly correlated to the following:

- Female proficiency for the LEA ($r = .290$, significant at the 0.01 level)
- Male proficiency for the LEA ($r = .272$, significant at the 0.01 level)
- Black proficiency for the LEA ($r = .202$, significant at the 0.05 level)
- White proficiency for the LEA ($r = .287$, significant at the 0.01 level)
- LEA proficiency for economically disadvantaged students ($r = .187$, significant at the 0.05 level)
- LEA proficiency for non-economically disadvantaged students ($r = .260$, significant at the 0.01 level)
- LEA proficiency for non-LEP students ($r = .286$, significant at the 0.01 level)
- Proficiency of students whose parents completed a graduate degree ($r = .220$, significant at the 0.05 level)
- PPE was negatively and significantly correlated to the following:
 - Male proficiency for the LEA ($r = -.332$, significant at the 0.01 level)
 - LEA proficiency for non-economically disadvantaged students ($r = -.285$, significant at the 0.01 level)
 - LEA proficiency for non-LEP students ($r = -.272$, significant at the 0.01 level)

- Proficiency of students whose parents completed high school and some courses ($r = -.230$, significant at the 0.05 level)
- Proficiency of students whose parents completed a four-year degree ($r = -.245$, significant at the 0.01 level)
- PPE minus CAT was negatively and significantly correlated to the following:
 - Male proficiency for the LEA ($r = -.495$, significant at the 0.01 level)
 - Black proficiency for the LEA ($r = -.283$, significant at the 0.01 level)
 - White proficiency for the LEA ($r = .201$, significant at the 0.05 level)
 - LEA proficiency for non-economically disadvantaged students ($r = -.437$, significant at the 0.01 level)
 - LEA proficiency for non-LEP students ($r = -.435$, significant at the 0.01 level)
 - Proficiency of students whose parents completed high school only ($r = -.222$, significant at the 0.05 level)
 - Proficiency of students whose parents completed high school and some courses ($r = -.311$, significant at the 0.01 level)
 - Proficiency of students whose parents completed junior college or a community college program ($r = -.241$, significant at the 0.05 level)

- Proficiency of students whose parents completed a four-year degree ($r = -.315$, significant at the 0.01 level)
- Proficiency of students whose parents completed a graduate degree ($r = -.304$, significant at the 0.01 level)

The results of this analysis show that there is a clear relationship between CAT and student achievement overall and across many of the dependent variables, as predicted by the Odden et al. model (2003). However, the analysis also shows that there is a clear, negative relationship between the total PPE and PPE without the influence of CAT, as predicted by Hanushek. This dichotomous situation where both research groups are seemingly supported is broken down in the following chapter, where possible explanations for the results are given. Specifically, the significant differences between CAT and the impact of PPE (both by itself and with the influence of CAT removed) needs to be critically analyzed in order to fully understand what is within these independent variables that causes polar opposite results on third grade student achievement on the NCREOG.

CHAPTER V

IMPLICATIONS AND RECOMMENDATIONS

Per pupil expenditure (PPE) is a controversial statistic commonly used in production-function analyses in educational research. The outcomes of these production-function studies, however, have rendered conflicting results as to the value of PPE to increase student achievement (Greenwald et al., 1994, 1996a, 1996b; Hanushek, 1981, 1986, 1991, 1996a, 1996b; Hedges, 1996; Laine, 1996). A model proposed by Odden et al.(2003) attempts to quell this debate by breaking PPE into seven components within the category of instructional per pupil expenditure (IPPE). Within the seven components that create IPPE, Odden et al. identify CAT as one of the most critical in predicting student achievement. While this model seemingly helps to clarify PPE, Hanushek (2007), an opponent of increasing PPE as an attempt to improve student achievement (1981, 1986, 1991, 1996a, 1996b), contends that such a model remains fiscally irresponsible and will not produce the results it promises. Determining if CAT is a significant contributor to student achievement could significantly contribute to a reform of school finances within the state of North Carolina. Knowing that reading is a critical skill for future academic success (Baydar et al., 1993; Cunningham and Stanovich, 1997), a significant, positive correlation between CAT and third grade NCREOG could have serious implications on how local, state, and even federal funds are utilized within schools.

Purpose and Hypotheses

The purpose of this study was to determine if a relationship exists between the instructional per pupil expenditure (IPPE) component of core academic teacher (CAT) and third grade student achievement on the North Carolina reading End of Grade exam (NCREOG). To make that determination, this study collected data from all 115 local education agencies (LEAs) in North Carolina. The collected data attempted to determine if the following hypotheses could be supported or rejected:

- Major Research Hypothesis: Public school districts (or local education agencies, LEAs) with a higher core academic teacher statistic will show greater student achievement on North Carolina's Reading EOG standardized assessment for third grade students than public schools districts with a lower core academic teacher statistic.
- Null Hypothesis: No statistically significant correlation will exist between CAT and third grade student proficiency on the NCREOG based on various demographic variables (gender, race, SES status, LEP status, and educational attainment of a student's parents).
- Alternative Hypothesis: Statistically significant and positive correlations exist between the CAT and third grade student proficiency on the NCREOG based on demographic variables (gender, race, SES status, LEP status, and educational attainment of a student's parents).

This chapter begins by giving a brief overview of the methodology and a summary of the results. Following each summary, an insight as to what may have caused such results is given. Finally, this chapter concludes with a discussion as to the

importance of such results and the value of such findings for school leaders and those involved in making decisions regarding the distribution of school funds.

Overview of Methodology

In order to determine if a correlation exists between CAT and student achievement on the third grade NCREOG, this study developed a derivation of the Odden et al. CAT statistic by combining the average salary and average fringe benefit package provided to teachers in each of the 115 school districts (also referred to as local education agencies, or LEAs) in North Carolina for the 2005-2006 school year. The student proficiency for the third grade NCREOG was also obtained from each of the public school districts in North Carolina for the 2005-2006 school year. Average per pupil expenditure was collected for each school district and included all federal, state, and local funding. In addition to overall student proficiency on the third grade NCREOG, student proficiency based on various demographic data (gender, race, SES status, LEP status, and educational attainment of a student's parents) was also collected from each school district.

Once all of the information was collected and loaded into *SPSS Base 16.0 for Windows* (SPSS), the data were analyzed using bivariate correlations in which Pearson's correlation coefficient revealed the strength and direction of any relationships between the independent and dependent variables. A two-tailed significance test was also implemented to identify any data that would be significant at the 0.05 or the 0.01 level.

After running the data with PPE and CAT as the independent variables and the various proficiency categories as the dependent variables, it was clear that

another variable should be incorporated. Because CAT is a measure of teacher salary and fringe benefits, it has a significant impact on PPE. As such, a linear regression was run to remove the impact of CAT out of PPE. The result was an independent variable called PPE minus CAT which was then included in the full analysis of the data. Following the analysis of the data, the results were placed into a series of tables that addressed the impact of CAT, PPE, and PPE minus CAT on each of the dependent variables.

Explanation of Results and Discussion

CAT and Overall Student Achievement on the NCREOG

The major research hypothesis was that schools with a higher CAT would have higher proficiency scores on the third grade NCREOG. The results support this hypothesis, as CAT is significantly and positively correlated to total LEA proficiency for third grade student achievement on the NCREOG ($r = .304$, significant at the 0.01 level). With a correlation of .304, this relationship is considered to be a medium, significant relationship (Field, 2005). The results clearly support the model put forth by Odden et al. (2003) in which CAT is identified as a key component in determining students' success.

When considering this result, it is important to recall what goes into developing CAT. The key pieces of CAT are average teacher salary, average supplement paid, average liability insurance, average retirement, average social security, and average hospitalization paid by each school district. As such, one might be quick to assume that school districts of higher wealth would, therefore, have higher CATs, as they have a far greater ability to pay higher salaries and benefits to teachers. In the state of North Carolina, however, many of these factors used to calculate CAT are set by the state. That

is, the teacher salary (state scale), liability insurance (8 %), social security (7.65 %), retirement (7.14%), and hospitalization (\$3,854) are the same rates for every single school district in North Carolina. The only factor within CAT that individual school districts have control over is the supplement paid to teachers. How much that supplement is varies from district to district; some districts do not offer a supplement. In addition, districts that do have salary supplements vary on how they pay them. Some districts pay a flat rate (e.g., \$3,000 for all teachers), while other districts pay a percentage of the salary (e.g., 12.0% of the scale salary). CAT, therefore, is relatively stable with the exception of the salary supplement. Yet, even if the supplement were left out, the CAT would differ from district to district due to the types of teachers being hired in various districts. Specifically, what ultimately impacts the salary scale is the educational attainment and experience of that teacher.

Greenwald, Laine, and Hedges (1996) have argued that the achievement of students on standardized assessments is largely based on the qualification of the teachers teaching those students. These qualifications are largely based on that teacher's experiences, education, and knowledge gained from peers (Wong, 2004). Both arguments would seem to fit the results found in this study. School districts with higher CATs do indeed have higher rate of overall proficiency, and this could very well be the result of qualified, knowledgeable, and effective teachers working with the students who are taking the third grade NCREOG.

Conversely, those school districts where the CAT is relatively low would indicate at least one of the following: absence of or a low salary supplement (in which case that district would have difficulty attracting high quality teachers), less experienced teachers,

or a teaching group with very few teachers attaining an advanced degree or National Board certification. In such a district, the majority of teachers would naturally be inexperienced teachers, most without advanced degrees in education or a field related to the area they are teaching, who are put in the position where they must teach students skills necessary to demonstrate proficiency on a high-stakes assessment at the end of the school year. As Kaufmann et al. (2002) have pointed out, new teachers are often placed in a situation where they receive very little advice or professional development as to how to best prepare students for the impending standardized assessment at the end of the school year. Even when a standard course of study is prepared for these teachers, the development of effective lessons and delivery of that curriculum can be somewhat of a mystery for these new teachers. Consequently, the students with these teachers are more likely to perform at a lower level of proficiency than they would with an experienced, qualified teacher.

In terms of this study, the scenario in which a district is full of inexperienced teachers would result in a lower CAT. According to the results of this study, students in these districts will have lower levels of proficiency on the third grade NCREOG. This is an outcome that districts must address if public schools in North Carolina are to give all students the greatest opportunity possible to be successful on the third grade NCREOG and, consequently, in their future academic endeavors.

CAT and Demographic Summary

CAT was significant and positively correlated for 45% of the dependent variables. Below is a list of the significant correlations, from strongest to weakest:

- Female proficiency for the LEA ($r = .290$)

- White proficiency for the LEA ($r = .287$)
- LEA proficiency for non-LEP students ($r = .286$)
- Male proficiency for the LEA ($r = .272$)
- LEA proficiency for non-economically disadvantaged students ($r = .260$)
- Proficiency of students whose parents completed a graduate degree ($r = .220$)
- Black proficiency for the LEA ($r = .202$)
- LEA proficiency for economically disadvantaged students ($r = .187$)

CAT and Gender

CAT had the strongest correlation to the proficiency of third grade female students within the LEA on the NCREOG. The third grade male students also had a similar strength correlation on the NCREOG. At first glance, one may question why CAT had such a significant impact on males and females. The fact is, however, that these results should not be so surprising. This result can be explained by examining the correlation of CAT to total third grade LEA proficiency. CAT to overall LEA proficiency revealed a positive, medium, significant relationship ($r = .304$, significant at the 0.01 level). Since females and males comprise the entire population in each LEA, it would be expected that like total LEA proficiency, each gender would also show a positive, significant correlation to CAT.

What is somewhat more challenging to explain is the difference between the magnitude of the relationship of male and female proficiency on the NCREOG to CAT. In examining the raw data, male students outperformed female students in only 7 of the 115 school districts. Females are not only more likely to be proficient, but on a state

average, the proficiency of female third grade students was 85.1% while the proficiency for male third grade students was 78.9%. This difference would help to explain why the magnitudes of the correlations vary, but it does not help explain why females are outperforming males. While this topic is outside the scope of this study, similar findings have been reported where females outperform males in reading on the National Assessment of Educational Progress (NAEP). Klecker (2006) examined student reading achievement on the NAEP for fourth, eighth and twelfth grade student for the years 1992, 1994, 1998, 2000, 2002, and 2003. Her analysis found that females consistently outperformed their male counterparts.

CAT and Race

CAT had the second largest impact on predicting third grade student proficiency on students that are white ($r = .287$). High proficiency on the NCREOG for third grade black students was also predicted by CAT ($r = .202$). As with the situation in which proficiency rates for both males and females on the third grade NCREOG showed a significant, positive correlation to CAT, the case may be the same when considering both black and white students' proficiency on the NCREOG. According to the Public Schools of North Carolina's Accountability and Service Division, the total number of third grade students who took the reading NCREOG in 2005-2006 was 107,251. Of those students, 59,455 (or 55.4%) were white and 29,648 (or 27.6%) were black. Combined, the black and white students comprised roughly 83% of the entire third grade student population taking the NCREOG in 2005-2006. As these two dependent variables account for 83% of all students who took the standardized assessment and the correlation of overall student

proficiency to CAT was of medium strength and in the positive direction ($r = .304$, significant at the 0.01 level), such an outcome makes sense.

The discrepancy between the impact of CAT on white students and black students, however, is a bit more challenging. To explain the discrepancy between white and black student proficiency on the third grade NCREOG, one must consider the achievement gap between white students and their minority peers. That a gap exists between white and black students on the overall proficiency ultimately is a replication of a phenomenon experienced through public schools in the United States. As English (2002) argues, standardized, high-stakes assessments are inherently biased towards white students, as they typically come from high SES households where the cultural capital is greater. It is this cultural capital that English argues is highly valued by schools and embedded throughout these standardized exams. This explanation would also hold for the differences seen in the strength of magnitude that is seen between black and white students' proficiency on the third grade NCREOG and CAT.

The positive that comes out of this analysis is that the higher CAT is positively correlated to student achievement. This again may be largely due to the fact that the only way to have a high CAT for a district would be to have teachers who have longevity in the education profession and/or who have advanced degrees. It is obvious, therefore, that those district with a higher CAT are likely comprised of teachers who have advanced degrees, longevity in education, or both. Such experiences and education can be helpful in working with a diverse group of students and increasing student achievement regardless of race. Heck (2007) found similar results in a study that examined nearly 200 elementary school (N=197) and the impact that quality teachers had on student

performance. Across the board, teachers with high professional characteristics (i.e., education and longevity) far outperformed their counterparts regardless of race, SES, LEP status of the students they were teaching.

CAT and SES

Two other relationships that were significant and positively correlated to CAT were third grade student proficiency on the NCREOG for both economically disadvantaged ($r = .187$) and non-economically disadvantaged students ($r = .260$). The outcome of both of these correlations was also expected, as the two categories comprise the entire student population and it is already known that the overall LEA proficiency revealed a positive, medium, significant relationship ($r = .304$, significant at the 0.01 level). On a statewide basis, non-economically disadvantaged students comprised 48.6% of the student population taking the third grade NCREOG, while economically disadvantaged students comprised 51.4%. This situation, again, is similar to the relationship between gender and CAT in which roughly half of the students being tested were in one category (females) and the others were in the other category (males). Where the significant difference is apparent, however, is that CAT was a greater predictor of proficiency for non-economically disadvantaged students than it was for economically disadvantaged students on the third grade NCREOG.

That economically disadvantaged were outperformed by their peers indicates that certainly SES does have an impact on a student's ability to perform on the third grade NCREOG. The Coleman Report (1966) stated that student success is largely predicted by whom a student goes to school with as well as that student's family environment. James Coleman would later call this "cultural capital," as it encompasses several different

variables, including SES, that enable a student to readily access skills, knowledge, parental involvement, and other resources that are valued by public schools (Coleman & Hoffer, 1987). English (2002) also argues that SES is a single component of cultural capital and that standardized assessments are inherently biased against students of lower SES. Such explanations certainly could explain why there was such a difference in the positive correlations between economically and non-economically disadvantaged students with CAT.

CAT and Non-LEP Students

CAT also showed a small, positive and significant correlation to students who were of non-limited English proficiency (LEP) status ($r = .286$). This finding indicates that the higher the CAT, the better the proficiency of non-LEP students on the third grade NCREOG. Non-LEP students comprise 93.2% of the students who took the third grade NCREOG for the 2005-2006 school year. The impact of this correlation, therefore, is largely due to the fact that the non-LEP dependent variable is essentially going to mimic the results of the overall proficiency of the LEA on the third grade NCREOG to CAT. As such, the finding that non-LEP is correlated to CAT is nothing of a surprise. The rationale for this relationship would follow the same explanation for the overall student proficiency of the LEAs to CAT.

Of concern is that LEP students were not impacted by CAT. Again, this may be due to the rather small number of third grade students assessed ($N=7,329$) which account for 6.4% of the third grade students who took the NCREOG. There is also a second logical reason which may account for this discrepancy. The fact that the NCREOG is in

English and not in the students' native language may also neutralize the impact of CAT on LEP student proficiency.

CAT and Academic Attainment

CAT was significantly and positively correlated to the proficiency of third grade students whose parents had achieved a graduate degree ($r = .220$). This relationship indicates that the higher the CAT, the greater the proficiency of third grade students on the NCREOG if their parents earned a graduate degree. Unlike the other dependent variables which comprised a large percentage of the overall percentage of students taking the NCREOG, students whose parents had a graduate degree account for just 4.8% of the student population.

As mentioned previously, a higher CAT is largely dependent upon the longevity and educational attainment of the teacher. Students whose parents have achieved a graduate degree likely have an advantage in learning from teachers of high CAT because of the probability that the very educational skills, techniques, procedures, and terminology that are valued within that student's home environment are the same that are valued by teachers who have a high CAT. This again goes back to the argument of cultural capital. However, unlike Coleman's (1966) argument that the peers have an influence on a student's performance on standardized test scores, this result goes more towards the impact of parent educational attainment on the student's performance.

CAT and Demographic Variables: What Does It Mean?

The alternative hypothesis of this study was that CAT would be positively correlated to the dependent variables. The null hypothesis was that CAT would have no impact on student achievement within these dependent variables. For female, male, black,

white, economically disadvantaged, non-economically disadvantaged, non-LEP, and students whose parents earned a graduate degree, the alternative hypothesis is supported and the null hypothesis is rejected. For Hispanic, multi-racial, American Indian, Asian, LEP, and students whose parents' education fell short of a graduate degree, the null hypothesis cannot be rejected.

While CAT showed positive and significant correlations to eight of the demographic variables, six of them could have been predicted once it was determined that CAT was significantly and positively correlated to the overall student proficiency for an LEA on the third grade NCREOG. The female, male, white, non-LEP, non-economically disadvantaged, and economically disadvantaged categories each accounted for almost half of the third grade students within that respective variable. As such, it would stand to reason that since CAT had a medium correlation to overall proficiency on the third grade NCREOG, any dependent variable that is comprised of a large portion of the student population taking the third NCREOG would also be significantly and positively correlated to CAT.

The two variables that did not comprise nearly half of their respective dependent variable categories were black students (27.6% of the students taking the third grade NCREOG) and students whose parents earned a graduate degree (4.8% of the students taking the third grade NCREOG). Knowing that the issue of the achievement gap is prevalent throughout public schools in the United States, the fact that black students performed better on the NCREOG when the district CAT was high is a very impressive result and a sign that perhaps the achievement gap can be closed with more resources aimed at developing and retaining quality, experienced teachers, a practice that would

result in an increased CAT. As addressed earlier, students whose parents have attained a graduate degree may be more likely to live in a home environment that shares the values or cultural capital that is found in the classrooms of teachers with higher CAT. The characteristics that would be necessary for a group of teachers to have a higher CAT (excluding local supplements) would be advanced degrees in their area of expertise and years of experience.

Does Money Matter?

One of the underlying debates that this study addresses is the question of whether or not increasing funds to schools truly makes a difference. The Coleman Report (1966) stated that increasing funds does not result in higher student achievement. Almost immediately this point was heavily criticized. During the 1980s and 1990s, however, this point was argued again by Hanushek (1981, 1986, 1991, 1996a, 1996b), who utilized an enormous meta-analysis of studies to analyze the impact of PPE on student achievement. His conclusion was that increases in PPE did not improve student achievement, essentially validating the Coleman Report 25 years after its release. His critics were numerous and came mainly from one group of researchers throughout the 1990s who not only criticized Hanushek's research methodology but also argued that higher PPE does improve student achievement because higher PPEs indicate other key factors such as low class sizes, teacher experience, and curriculum support that translate into higher student achievement (Greenwald et al., 1994, 1996a, 1996b; Hedges, 1996; Laine, 1996).

Odden et al. (2003) as well as Odden's research group with Lawrence Picus, Picus and Associates, have managed to stand clear of this argument by not arguing PPE, but rather specific components of PPE being supportive of increases in student

achievement. Hanushek (2007) has more recently attacked the model and the approach of Picus and Associates, stating that it is forcing school systems to increase their expenditure for unproven results. Ultimately it appears as though the confrontation seems to be the anti-PPE increase group of Coleman et al. and Hanushek versus the pro-PPE increase group of Greenwald et al. and Odden et al.

The results of this study clearly support Coleman et al. and Hanushek's argument that PPE alone does not improve student achievement ($r = -.215$, significant at the 0.05 level for PPE and $r = -.382$, significant at the 0.01 level for PPE minus CAT). In analyzing North Carolina PPE and third grade achievement on NCREOG, it appears that Hanushek's and Coleman et al.'s argument is supported. Greenwald et al.'s argument in favor of higher PPE is clearly not supported by this study, but Odden et al.'s argument in favor of increasing CAT is supported.

That CAT is a predictor of student achievement on the third grade NCREOG and PPE is not is very surprising. One would expect that, as teachers' salaries and benefits comprise nearly two thirds of a district's spending (Hanushek 1986), CAT and PPE would show similar correlations to student achievement on the third grade NCREOG. This is not the case, as CAT ($r = .304$) was a medium, positive, significant relationship, while PPE was a small, negative, significant relationship ($r = -.215$) that only got worse when the influence of CAT was removed ($r = -.382$). The question that must be answered is *why* it got worse.

It appears that Odden et al. (2006) were very accurate in stating that school districts have continuously spent money without carefully examining the impact of their spending for the last four decades. Even when more funds are made available to schools,

the money continues to be allocated to the same resources. Over the past four decades, PPE has increased by nearly 350% when taking into account inflation, yet the student achievement data has not seen increases commiserate with this expenditure. Odden et al. (2006) have argued that this is because those additional funds focused on the wrong areas (services outside of the core classroom) rather than the necessary areas of the classroom and especially core academic teachers. Ultimately, Odden et al. (2003, 2006) agreed with Hanushek (1981, 1986, 1991, 1996a, 1996b) that PPE does not make a difference. Odden et al., however, go one step further in arguing that PPE may not make a difference, but if school districts were to increase funds in the core classroom and especially in support of the teachers in the core classrooms, student achievement will increase. The results of this study support this line of argument by Odden et al. (2003, 2006) insofar as CAT and third grade student achievement on the NCREOG is concerned.

Implications

That the district CAT has a medium, significant correlation to student achievement on the third grade NCREOG is a very important finding. What makes this finding so important is that while CAT had that positive correlation, PPE had a significant, negative correlation. Clearly, this indicates that schools really need to examine how funds are being dispersed and begin to find ways to increase the funding in support of core teachers within the schools. As Odden et al. (2006) have correctly pointed out, this is not to suggest that funds be tightened for students receiving secondary services that would be viewed as essential for their academic success (e.g., exceptional children funds). Rather, school leaders and policy makers need to carefully reexamine how and where they are spending their funds. With the district CAT being a strong

predictor of student achievement on the third grade NCREOG, areas that truly need to be addressed are hiring practices, retention of quality teachers, professional development, and teacher allocation in individual schools.

Hiring and Teacher Allocation

The results of this study indicate that human resource departments may need to start monitoring who is hired for a teaching position and what that teacher is able to accomplish with students. Based on the results of this study, it seems likely that those teachers who have a higher CAT value would be effective in working with students and produce greater results on the third grade NCREOG. With reading being such a critical factor in determining future academic success (Baydar et al., 1993; Cunningham & Stanovich, 1997), it may seem wise to allocate the teachers with higher educational degrees and greatest experience into younger grades to help students develop the critical skill of reading. While theoretically this practice could help boost scores, it could also cause great strife: Such a practice could be very dangerous if schools were to allocate teachers solely based on their CAT value. This would disregard the non-measurable factors that could influence student achievement, such as a teacher's ability to interact with younger or older grades or even a teacher's personality.

Induction Plans

In addition to considering the allocation of teachers within a school, school districts and individual schools should start developing induction plans for new teachers to increase the retention of those teachers whose students consistently show growth on standardized assessments and whose collaboration with peers benefits multiple teachers and students. In developing an effective induction plan, schools would be making sure

that these teachers have the opportunity for effective professional development, have immediate access to experienced peers, can access and utilize resources that are already in place to support the curricula utilized by the teachers, and have support during the day to help troubleshoot any issues that may occur (Wong, 2004). All of these teacher supports are necessary implementations if longevity in education and the level of education a teacher has are in fact the major predictors of student success.

Using the Odden et al. (2003) Model

When it comes to the financial aspect of school districts, this study suggests that two necessary steps need to be taken. First, there is a glaring need to increase the amount of funds utilized to attract experienced and qualified teachers. As mentioned earlier, CAT is largely dependent upon experience, educational attainment, and the local supplement paid by the school district. All other factors are essentially the same from district to district in North Carolina. So, if a high district CAT results in higher student proficiency on the third grade NCREOG, then making all efforts to increase spending in these areas would seem essential.

The second step that must be taken is proper stewardship of funds. It is seen in the data from this study that money by itself does not positively impact student achievement. This is very clear from the negative, significant correlation of PPE to overall student achievement. Proper distribution, however, seems to make a big difference, as evidenced by CAT. The Odden et al. (2003) model considers seven IPPE components of which CAT is one. With this study validating the CAT portion of the Odden et al. model, it would seem appropriate for school leaders to move towards a new method of distributing school finances in a manner that benefits both teachers and students.

Recommendations for Future Studies

This study was limited in its ability to access some essential data on a school level but others on a district level only. Consequently, the CAT that was developed for this study takes into account salaries and benefits of all the teachers within the district and how that CAT correlates to student achievement on the third grade NCREOG for that district. The difficulty is that the majority of teachers who may have never interacted with the students whose scores were being utilized in this study. Of all the study's limitations, this is the most significant.

Future studies that focus on the correlation between CAT and student achievement could develop a CAT that would be expressed as a percentage using data that is teacher-specific. While this opportunity was not available for this study, as individual teacher salary information is no longer available on a district basis for the 2005-2006 school year (records were reportedly purged to prepare for a new statewide financial accounting program), the following equation would be ideal in calculating the CAT for individual schools:

$$\text{CAT} = \frac{\text{FTE} * (\text{Average 3}^{\text{rd}} \text{ Grade Teacher Salary} + \text{Average 3}^{\text{rd}} \text{ Grade Teacher Benefits})}{\text{Total Students Tested} * \text{PPE}}$$

This CAT statistic would be specifically for third grade teachers rather than the average teacher in the county; however, it could be utilized for any grade level that a researcher would want to examine. Were this formula implemented, the influence of CAT could be examined on a school-by-school basis and not just a district-by-district basis.

A second limitation to this study is that it only utilizes one of the seven components recommended by the Odden et al. model (2003). While Odden et al. (2003, 2006) have suggested that CAT is one of the most important components in increasing student achievement on standardized assessments, they have also suggested that other six components also play a role in increasing student achievement. While these remaining six components were not addressed in this study, future studies should attempt to incorporate CAT along with several others, if not all components, in order to determine the extent to which each component influences student achievement. Such information would be extremely useful for school decision makers who are responsible for allocating school funds.

A third limitation of the study is that it focused only on the data coming from North Carolina. As such, generalizations as to how CAT impacts student achievement on third grade standardized assessments in other states cannot be made.

A final limitation of this study is the method in which the data were collected. All data from this study was obtained from publications from North Carolina Public Schools. This means that the researcher for this study was not going from individual district to district to obtain directly the data regarding teacher salaries, benefits, and student proficiencies. All of this information is reported from each individual district to North Carolina Public Schools and then placed in either a publication, a database on the North Carolina Public Schools' website, or both. The assumption, therefore, is that the districts were accurately reporting all of their data. Future studies that are focusing on a specific school district or a handful of school

districts may be better served to contact directly the data and accountability (or testing) division and the human resources division for each of the school districts being studied.

As a whole, the recommendations described in this section would help to decrease the number of limitations found in this study. Adhering to these suggestions for future studies is that the results from the data could be used on a much broader scale than those from this study. Ultimately, the goal would be to make certain that school leaders have the most reliable data that could be utilized to fundamentally reform the school finance structure of the school or school district in order to maximize student achievement.

Future Studies Based on Results of Current Study

Some of the more interesting data emerging from this study includes the fact that PPE was negatively correlated to third grade student achievement on the NCREOG, the demographic variables were neither positively nor negatively impacted by CAT, PPE, or PPE minus the CAT influence, and that males were negatively impacted by PPE while females were not impacted at all. Learning more about each of these areas would be of critical concern not just to policy makers, but certainly to public school leaders and practitioners.

When addressing the issue of PPE, future studies should examine how various school systems are utilizing funds outside of teacher salary and benefits. The results of this study indicate that the funds left over after paying for core teachers are not having a positive impact on student achievement. This is a serious problem within the school systems that could be remedied if there were a way to

determine where and how that money is being spent. Although some funds such as “at-risk” funds must be spent for “at-risk” students, the oversight as to how these funds are spent and if those practices are beneficial is minimal. Studies targeting the utilization of these funds would help public school leaders and practitioners gain a greater understanding of how to best utilize the dollars and likely move towards a reform in spending practices across the state of North Carolina.

A second very important outcome that is revealed in this study is that none of the independent variables had a significant impact on student achievement on the NCREOG if students were economically disadvantaged, Multi-Racial, Hispanic, American Indian, Asian, or limited English proficient (LEP) or had parents who had achieved a trade or associate’s business degree. The question as to why there is was no impact is one that must be answered. With the American public school system’s being designed to meet the needs of the majority of students, these students who are not in a majority demographic are already put at a disadvantage. If the methods of spending strategies currently being used at a district level are not addressing the learning opportunities of these students within the school building, adjustments must be made. Future studies could utilize both quantitative and qualitative strategies to target the relationship of the independent variables on these demographics to determine if shifts are taking place and also to reveal what the practices are that are currently implemented at the school and district level that are aimed at helping these student achieve at higher levels than those that have been attained in the past.

One other significant finding of this study that needs further examination is the negative impact of PPE on male students that was magnified when the influence of CAT was removed. Conversely, females were neither positively nor negatively impacted by PPE even when the influence of CAT was removed. Such an inequity is of serious concern and suggests several possible explanations, ranging from a social explanation of elementary students' being taught primarily by female teachers to a biological explanation of brain development causing various processes to appear at different times for males and females. The scope of this study is unable to address this issue, but with such a significant difference, this is a topic that certainly deserves great attention as it impacts roughly half of the students attending public school.

Dissemination and Practical Use

The results of this study reveal a positive, significant relationship between CAT and third grade student proficiency on the NCREOG. Conversely, this study also reveals a negative, significant relationship between PPE and student proficiency on the NCREOG. Having such results simply written and discussed in this paper will not provide the academic community with information that could influence the way public schools in North Carolina address the allocation of their funds. As such, it is the intent of the author to disseminate this study to those in education who may be most impacted by these findings. Condensing this study and getting it published in school business publications as well as discussing or presenting at school business conferences would be of benefit to those leaders and scholars who work or conduct research in the financial aspects of public education.

Additionally, because this study utilized data from the state of North Carolina, it would be advantageous to administrators throughout the state were they able to read about this study in a general administrative journal that targets North Carolina public school leaders. Ultimately, these efforts to disseminate the findings of this study are important, as they can help public school leaders and education policy makers make better informed decisions about how money could be allocated in order to increase student achievement.

While the dissemination of this information is important, how to use these results is equally important. As mentioned in the section above, there are significant findings that come out of this study that were not anticipated. Results and analysis from future studies can help address some of these unanticipated results and their implications for education, but for the current study the implications can be immediate. From a school-based perspective, school leaders need to consider who is teaching the students and how they are spending their funds. Based on the results of this study, a school that has a high PPE would have a lower percentage of students who are proficient on the third grade NCREOG. Knowing this, a leader at such a school would want to be proactive and carefully examine how funds are being spent. Are those funds being utilized to target the core subject areas? Are the funds being spent in a way that will help fulfill that school's mission? Spending out of habit is a dangerous practice that requires a great deal of reflection on the part of principals, school finance officers, and other central office personnel.

The debate of whether or not a policy is created at a school or district level regarding CAT and who teaches various subjects is another outcome of this study.

Theoretically, those teachers with a higher CAT should be placed in classrooms where there are “high-stakes” standardized assessments because of the positive correlation revealed in this study. As mentioned, this statistically makes sense, but it does not take into consideration the other dynamics that vary so greatly from school to school. Principals certainly should be aware of the talents, skills, deficiencies, and personalities of their teachers and how that those factors may impact the various talents, skills, deficiencies, and personalities of the students. Were all factors equal in regards to human behavior, certainly the higher CAT teachers could be placed in classes with “high-stakes” standardized exams. Education is not and cannot be broken down into simplistic numbers. Each individual within the school community brings an infinite number of variables to the school building. Consequently, the judgment of the school leader must play a key role in deciding proper placement of classroom teachers in order to provide students with the greatest possible education. This judgment call should take into consideration the results found within this study.

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