Is School Size Important? A Study of the Relationship Between School Size and Advanced Achievement in Public Secondary Schools in Virginia

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ABSTRACT

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The primary focus of the current study was to determine if there is a relationship between size of high school and advanced academic achievement as measured by the Virginia Index of Performance while statistically controlling for multiple combinations of the following variables; socioeconomic status, urbanicity of school, per-pupil expenditure, and student-teacher ratio. The combinations of variables used in the current study were determined by knowledge gained in the review of the literature.

Level of award on the Virginia Index of Performance, school enrollment, percentage of students receiving free or reduced lunch prices, per-pupil expenditures, student-teacher ratios, and school locale were collected for all high schools in Virginia with 9^{th}-12^{th} grade configurations for school years 2006-07 through 2008-09. A sequential multiple regression analysis was conducted using level of Virginia Index of Performance award earned as the dependent variable and school size as the primary predictor variable while statistically controlling for per-pupil expenditure, student-teacher ratio, socioeconomic status, and urbanicity in different combinations.

The analyses performed on the collected data revealed that school size, when other variables were accounted for, was not a significant predictor of performance on the

Virginia Index of Performance incentive program. When the analyses were performed for Research Question 2, however, socioeconomic status was found to be a significant predictor of performance on the Virginia Index of Performance incentive program.

Multiple limitations should be noted when interpreting the results of the analyses. The main limitations to the current study were a restricted population of schools due to confines placed on grade configurations of schools included in the study and the initial criteria of making Adequate Yearly Progress for two consecutive years in order to be eligible to receive an award in the Virginia Index of Performance program. The combination of these restrictions resulted in a large number of schools being excluded from the current study. Due to the range restrictions placed on the studied population, the relationship between size of school and advanced student achievement could be stronger than reported. Future research should include a less restricted population of schools and other measures of advanced student achievement.

Dedication

To my wife, Amy, you have been an amazing support not only with this project but throughout our life together. You always believe in me even when no one else does or should. Without you, this and every other accomplishment in my life would have been impossible. I love you!

To my daughter, Alexis, your smile and positive attitude always inspire me. You say that you want to be a teacher when you grow up; I know you will be a great one because you have taught me more about life than you will ever know. *Don't rule out cosmetology.*

To my son, Isaac, your kidding has enabled me to keep everything in perspective while I have worked on this project (I didn't start using "big words" when I enrolled in this program). Dream big – if I can become a Dr., anything is possible.

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God, “I can do all things through Christ which strengtheneth me”, Philippians 4:13.

TABLE OF CONTENTS

CHAPTER		PAGE
1	Introduction	1
	Setting the Context for the Inquiry	1
	Organization of the Literature Review	6
	Exploring the Current Status and the Historical Background	7
	Examining Theoretical and Commentary Literature	11
2	Review of the Literature	13
	School Size	13
	Socioeconomic Status	21
	Urbanicity	25
	Per-Pupil Expenditure	29
	Student-Teacher Ratio	32
	Conclusions and Implications	36
	Purpose Statement	37
	Research Questions	38
3	Methodology	41
	Introduction	41
	Population to be Studied	41
	Definition of Variables and Collection of Data	42
	Level of Award	43
	School Size	44

	Socioeconomic Status	44
	Student-Teacher Ratio	45
	Urbanicity	45
	Per-Pupil Expenditure	45
	Data Analysis	46
4	Findings	49
	Introduction	49
	Description of the Schools	49
	The 2006-07 Academic Year	49
	The 2007-08 Academic Year	53
	The 2008-09 Academic Year	56
	Data Analyses	60
	Data Analyses for Research Question 1	61
	The 2006-07 Academic Year	61
	The 2007-08 Academic Year	63
	The 2008-09 Academic Year	65
	Data Analyses for Research Question 2	66
	The 2006-07 Academic Year	67
	The 2007-08 Academic Year	68
	The 2008-09 Academic Year	70
	Data Analyses for Research Question 3	70
	The 2006-07 Academic Year	70
	The 2007-08 Academic Year	72

The 2008-09 Academic Year 73

Data Analyses for Research Question 4 73

The 2006-07 Academic Year 75

The 2007-08 Academic Year 75

The 2008-09 Academic Year 76

Summary 78

5 Summary and Implications 79

Introduction 79

Overview of the Current Study 79

Summary of the Findings 80

Limitations 81

Implications 84

Suggestions for Future Research 85

Revising the Conceptual Framework 88

Conclusions 89

REFERENCES 91

APPENDIX A Virginia Index of Performance Incentive Program Bill 100

APPENDIX B Virginia Index of Performance (VIP) Point System 101

APPENDIX C National Center for Educational Statistics – Sample Data 104

APPENDIX D Excerpt from Table 15 of the Superintendent's Annual Report 2009 105

APPENDIX E State Level Summary Report for the Virginia Index of Performance – 2007-2008 Sample 106

APPENDIX F Copyright Permission from the Rural Sociological Society to Use

Figure 1 107

LIST OF TABLES

Tables

Table 1	Summary of Points System for Various Proficiency Levels	5
Table 2	Virginia Index of Performance Point System-High Schools	5
Table 3	School Size and Free/Reduced Lunch Prices Categorization	23
Table 4	Equity Analysis of Student Achievement	23
Table 5	Effects of School Location on the Mean Baseline Performance Compared to Metro Schools	27
Table 6	Effects of School Location on the Mean Annual Gain Compared to Metro Schools	28
Table 7	Equation Variables	33
Table 8	Results from Student Achievement Equations and Optimal Class Sizes	36
Table 9	2006-2009 Virginia High School Characteristics	43
Table 10	NCES Urban-Centric Locale Codes	46
Table 11	Sample Data for Patrick Henry High School-Glade Spring	47
Table 12	Number of Awards Received in Each Locale in 2006-07	51
Table 13	Ranges of School Size, Per-Pupil Expenditure, Pupil-Teacher Ratio, and Socioeconomic Status by Award Level for 2006-07	52
Table 14	Means and Standard Deviations of Socioeconomic Status, Pupil-Teacher Ratio, Per-Pupil Expenditure, and School Size for 2006-07	53
Table 15	Number of Awards Received in Each Locale in 2007-08	54

Table 16	Ranges of School Size, Per-Pupil Expenditure, Pupil-Teacher Ratio, and Socioeconomic Status by Award Level for 2007-08	55
Table 17	Means and Standard Deviations of Socioeconomic Status, Pupil-Teacher Ratio, Per-Pupil Expenditure, and School Size for 2007-08	57
Table 18	Number of Awards Received in Each Locale in 2008-09	58
Table 19	Ranges of School Size, Per-Pupil Expenditure, Pupil-Teacher Ratio, and Socioeconomic Status by Award Level for 2008-09	59
Table 20	Means and Standard Deviations of Socioeconomic Status, Pupil-Teacher Ratio, Per-Pupil Expenditure, and School Size for 2008-09	61
Table 21	Correlations Between All Variables for Academic Year 2006-07	62
Table 22	Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status, Urbanicity of School, Per-Pupil Expenditures, and Student-Teacher Ratio into Account	63
Table 23	Correlations Between All Variables for Academic Year 2007-08	64
Table 24	Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status, Urbanicity of School, Per-Pupil Expenditures, and Student-Teacher Ratio into Account	65

Table 25	Correlations Between All Variables for Academic Year 2008-09	66
Table 26	Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status, Urbanicity of School, Per-Pupil Expenditures, and Student-Teacher Ratio into Account	67
Table 27	Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status into Account	69
Table 28	Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status into Account	69
Table 29	Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status into Account	71
Table 30	Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Per-Pupil Expenditures and Student-Teacher Ratio into Account	72

Table 31 Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Per-Pupil Expenditures and Student-Teacher Ratio into Account 74

Table 32 Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Per-Pupil Expenditures and Student-Teacher Ratio into Account 74

Table 33 Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status and Urbanicity of School into Account 76

Table 34 Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status and Urbanicity of School into Account 77

Table 35 Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status and Urbanicity of School into Account 78

LIST OF FIGURES

Figures

Figure 1	Academic Growth of Schools in All Locations Over Five Years	27
Figure 2	Conceptual Framework	38
Figure 3	Revised Conceptual Framework	90

Chapter 1

Introduction

Setting the Context for the Inquiry

Much attention has been paid over the last decade to assessments that measure student performance on minimum competency, end-of-course tests (McDonald & Hannafin, 2003; Sherman & Grogan, 2003; Struyven, Dochy, Janssens, Schelfhou, & Gielen, 2006). Virginia has been a leader on the national education stage with respect to performance on minimum competency assessments (Pyle, 2006). The Commonwealth of Virginia is also leading the charge in shifting the focus from meeting minimum competency standards to preparing students to achieve at levels that are more advanced than proficient (Roth, 2007). As the requirements of No Child Left Behind (No Child Left Behind Act, 2001) lead schools closer to the goal of 100% of the students being successful on minimum competency assessments, Virginia has raised the bar even higher by encouraging students and schools to aim for loftier levels of performance.

In addition to requiring states to set minimum standards, the No Child Left Behind Act mandates that if a school does not meet the minimum requirements, it receives sanctions. However, the Virginia Board of Education decided that rather than only penalizing schools that are low performing, they will offer incentives to schools that perform at an advanced level of proficiency as measured by a performance index – the Virginia Index of Performance incentive program. These incentives are consistent with Objectives 2 and 3 of the Virginia Board of Education's Comprehensive Plan for 2007-2012 (Virginia Board of Education, 2007). According to a press release by the Virginia Department of Education (Pyle, 2007), Governor Tim Kaine endorsed the Virginia

Department of Education's Virginia Index of Performance initiative because it supported his educational vision of moving from Competence to Excellence:

> The Board of Education is answering my challenge to encourage and reward academic excellence, said Governor Kaine. With the VIP (Virginia Index of Performance) incentive program, schools and divisions that have mastered the SOLs (Standards of Learning) will earn further recognition for meeting goals that exceed our minimum competency standards while preparing children for productive lives and the opportunities of the global marketplace. (Pyle, 2007)

As recently as June 29, 2009 at the Virginia Association of Secondary School Principal's Summer Conference, Virginia Board of Education President Mark Emblidge in opening remarks to the group cited the Virginia Index of Performance incentive program as one of the top eleven accomplishments of the Board of Education in school year 2008-2009. Even more recently, the General Assembly of the Commonwealth of Virginia elevated the importance of the Virginia Index of Performance incentive program by making the program a requirement by law. The bill was passed unanimously and signed into law on March 9, 2010 by Governor Bob McDonnell (Virginia Index of Performance Incentive Program, 2010). The bill can be found in Appendix A.

The Virginia Index of Performance incentive program is based on performance objectives that are different for elementary, middle, and high schools. The initial requirement for eligibility in the Virginia Index of Performance incentive program is that schools must make Adequate Yearly Progress for two consecutive years. The performance objectives for high schools include increasing enrollment in Advanced Placement and Dual Enrollment courses, increasing the percentage of students scoring

advanced on end-of-course tests, and increasing the percentage of students receiving an Advanced Diploma (see Tables 1 and 2). These performance objectives provide an avenue for recognizing high schools across the Commonwealth that perform at high academic levels. A points system based on the performance objectives is used to determine the level of awards that are given to schools.

Initially, schools received a major portion of their Virginia Index of Performance incentive program score by being awarded a certain number of points for different proficiency levels obtained by students on end-of-course Standards of Learning tests in English, math, science, and social studies combined. In 2009, a slight change was made to the criteria when the Virginia Department of Education required that SOL scores in English, math, science, and social studies be considered separately (Virginia Department of Education, July 2009). The total number of points earned by each school based on proficiency level is then divided by the total number of tests taken in the school. Each school has the potential to earn additional points by meeting other performance objectives.

Table 1 details how points are awarded for various proficiency levels obtained by students on end-of-course tests. In order to receive the highest level of award, the Governor's Award, high schools must receive a score of 80 points, have at least 25% of students enrolled in AP or Dual Enrollment courses, have an increase in the number of students earning a career and technical certification, and have at least 57% of students earn an Advanced Diploma. Schools that earn a score of 80 points but fail to meet the other three criteria receive the second highest level of award on the Virginia Index of Performance incentive program, the Excellence Award. In order to earn the next level of

award, the Competence to Excellence Award, a school must earn between 75 and 79 points. A listing of the performance objectives, performance measures and point values for high schools is provided in Table 2, and a complete listing can be found in Appendix B.

An area of particular interest with regards to the differences between schools that are experiencing growth in advanced achievement and those that are not is school size. The Virginia Index of Performance incentive program highlights this area in noticeable fashion. Of the ten high schools that received the highest level of recognition in 2008, the first year of the awards in Virginia, enrollments ranged from 1096 students to 3225 students. There were no schools from Group A (the 96 schools in the Commonwealth of Virginia with enrollments between 160 to 720 students, the group of smallest schools as classified by the Virginia High School League) that received the highest level of recognition. Only one school in Group AA (the 100 schools with enrollments ranging from 450-1500 students) received this distinction. The remaining nine schools that received the highest level of recognition were in Group AAA (the largest classification in the Virginia High School League which includes schools with enrollments ranging from 1095-3274 students) (Virginia High School League, 2006). The second year of the Virginia Index of Performance incentive program awards demonstrated a similar pattern. Fifteen high schools received the highest level of recognition in 2009 and their enrollments ranged from 1130 students to 3000 students. In the third year of the Virginia Index of Performance incentive program awards, only seven high schools received the highest level of recognition. Of these schools, one had an enrollment of 185 students while the other six had more than 1130 students.

Table 1

Summary of Points System for Various Proficiency Levels

SOL/State Assessment Scaled Score	SOL/State Assessment Proficiency Level	Points Awarded Each Score
500-600	Advanced	100
400-499	Proficient	75
Below 400	Fail	0

*The total number of points awarded is divided by the number of tests taken.

Table 2

Virginia Index of Performance Point System – High Schools

Performance Objective	Performance Measure	Points Earned
Increase the percentage of high school students taking AP, IB, and dual enrollment courses	Percentage of high school students enrolled in one or more AP, IB, or dual enrollment courses increases annually	1 Point
Increase the number of career and technical industry certifications, state licenses, or successful national occupational assessment credentials earned by high school students	Number of career and technical industry certifications, state licenses, or successful national credentials earned by high school students increases annually or relative to enrollment	1 Point
Increase the percentage of high school graduates earning an Advanced Studies Diploma	Percentage of graduates earning an Advanced Studies diploma out of the total number of diplomas awarded increases annually	1 Point

Performance Objective	Performance Measure	Points Earned
Increase the percentage of students who receive a high school diploma recognized by the Board of Education	Percentage of students earning a Board recognized diploma increases annually compared to ninth-grade enrollment four years earlier	1 Point
Increase the percentage of students achieving at higher levels of proficiency on state assessments	Percentage of students in each subgroup achieving Advanced Proficient on state assessments increases annually	1 Point
Increase participation in the Governor's Nutrition and Physical Activity Scorecard Awards Program	School earns Governor's Nutrition and Physical Activity award	1 point

Organization of the Literature Review

As a result of the discrepancy between the number of small schools that did not receive the highest award in the Virginia Index of Performance incentive program and larger schools that did, a review of relevant school size literature as it relates to student performance was conducted. In addition to school size, other characteristics were examined as well. The percentages of students who receive free or reduced lunch prices were considered when evaluating these schools (socioeconomic status). Urbanicity is a characteristic of schools that is often taken into account by researchers when examining factors that affect student achievement (Howley & Howley, 2004; Reeves & Bylund, 2005); therefore, urbanicity was included in the review. Additionally, educators often point to per-pupil expenditures and student-teacher ratio as important factors when examining variables that influence student performance and literature in this area was examined (Alspaugh, 1994; Borland, Howsen, & Trawick, 2005; Diaz, 2008). Finally,

literature related to the relationship between these factors and student achievement when considered in various combinations was examined.

Exploring the Current Status and the Historical Background

Prior to and during the Progressive-era, which began around the turn of the century and ended around 1914, school age children often worked outside the home and did not attend school. Reforms of this time period, such as laws aimed at preventing child labor, made it difficult for children to find employment, and as a result, more students stayed in school (Hylden, 2005). At the same time, John Dewey advocated for the need to educate everyone regardless of personal potential or individual plans for either post-secondary education or entering a professional vocation (Dewey, 1916). The combination of these progressive philosophies resulted in the creation of comprehensive high schools. Large schools were built to accommodate the diverse needs of an evolving group of students while, at the same time, being economically efficient to operate. As a result of the trend to build larger high schools, 60% of American high school students attended schools with enrollments of over 1,000 students in the early years of the 21st Century (Toch, 2003).

According to Hylden (2005), there are a multitude of reasons to explain why building large buildings to house large enrollments is no longer a responsible answer to an ever increasing number of students who need a practical place to learn. Students who attend schools with smaller enrollments, on average, perform better academically, have lower drop out rates, attend college more frequently, and as a result, earn higher salaries over their lifetime. Hylden also contends that these students also attend school more regularly, participate in more extracurricular activities, and experience less school

violence. Raywid (1997) goes so far as to say that enough reliable evidence exists to indicate that when the positives of small schools are weighed against the negatives of large schools, it has become morally questionable to continue to build schools to accommodate large enrollments.

School size has been the subject of research at least since the era of the Great Depression ("Pupil progress in small schools," 1929) and has continued to be a topic of interest for the last nine decades. The operational definitions researchers have used and the findings they have reported have varied considerably over time. For example in the 1929 study cited above, the researcher reported that students at a large school achieved an average score of 99 on an achievement test while students in small schools scored an average of 94 on the same test. However, it is important to note that the small school was defined as a one room school while the large school was defined as a nine room school ("Pupil progress in small schools," 1929). Additionally, in 1959 Lynn reported that large schools produced higher achieving students (i.e., an average of 12.9 awards per 100 students) than did small schools (i.e., 1.1 awards per 100 students), with large schools being described as having enrollments larger than 800 and small schools defined as having enrollments smaller than 300. Lynn's research (1959) was conducted in an attempt to clarify the conflicting findings reported by Pedley (1956), who found that students from large schools performed better, and by Oldfield (1958), who found that students from small schools produced better results. It should be noted that Oldfield's (1958) findings were not the norm for this time period according to Howley and Howley (2004). From the turn of the century until 1974, most researchers concluded that large

schools were preferable; however, beginning with the 1974 Stemnock study, Howley and Howley (2006) have concluded that most scholarly judgment favors smaller school size.

According to Meier, there are three main characteristics that good schools share; smallness, autonomy, and choice (Meier, 2004). As a result of this philosophy Meier, in conjunction with the New York Center of the Coalition of Essential Schools, proposed that three of the worst performing large high schools in New York City be reorganized. The proposal suggested that the schools be restructured into five or six small learning communities while continuing to be populated by its former students.

The proposal was accepted and academic performance results were reported for the high schools five years later (Meier, 2004). The National Center for Restructuring Education, Schools, and Teaching validated that the projects' goals were successful from a quantitative and qualitative standpoint. Quantitatively, the projects goals were met as demonstrated by increased graduation rates, lower dropout rates, improved daily attendance, and an increase in the percentage of students enrolling in post-high school education. Qualitatively, the project goals were met as shown by increased parent involvement and a safer school environment. According to Meier, a study was conducted on the same group of schools that found there was a slight increase in per-pupil expenditure. However, there was a decrease in per-pupil expenditure when per-pupil expenditure was calculated on a per-graduate basis.

Even though most researchers since 1974 have found that there is a positive relationship between small schools and student achievement, some researchers have disagreed about the influence of school size on student achievement. Daresh (1984), defining large schools as having enrollments of over 3,000 students and small schools as

having enrollments of less than 1,500, found no relationship between school size and academic achievement. In contrast, Coladarci (2006) found that small schools defined using a by-grade analysis because a K-8 school with 270 students is much smaller than a 6-8 school with 270 students, have a significant positive effect on achievement when socioeconomic factors are taken into account. Another study with similar results has been reported by Fowler and Walberg (1991). Fowler and Walberg regressed 18 school outcomes on 23 school characteristics and found that seven characteristics had a significant relationship with student achievement: the percentage of low income students, the socioeconomic status of the district, school size, number of schools in the district, percentage of teacher's with Bachelor's degrees, student-teacher ratio, and average teacher salary. To further complicate the picture, Wainer and Zwerling (2006) contend that drawing the conclusion that higher achievement in small schools is a result of misinterpreted data because small schools are over represented at both ends of the achievement spectrum, a variation that is expected.

As this brief overview of the relevant literature reveals, research regarding the relationship between school size and student achievement has produced mixed results. Another example of the lack of consensus in school size research is that the Bill and Melinda Gates Foundation has changed its philosophy regarding the importance of school size on two different occasions. In 2000, the Bill and Melinda Gates Foundation began a grant program that encouraged large high schools to split up into small learning communities in order to offer a more personable approach (Wainer & Zwerling, 2006). In 2005 the Bill and Melinda Gates Foundation touted the small learning community initiative when speaking to the National Governor's Association. However, the

Foundation reversed its position three years later because they had not seen dramatic improvement in students' college readiness (Ravitch, 2008). Another example of the ambiguous nature of small school research is that a renowned educational reform advocate, Theodore Sizer, barely mentioned school size in his first book, Horace's Compromise (1984), but strongly advocates for smaller schools in Horace's Hope (1996). Additionally, Loveless and Hess (2007) have suggested that when small schools do have an effect on student achievement, it is at best a modest one.

Additionally, there have been many studies dealing with student achievement in relation to student factors such as race, ethnicity, socioeconomic status, and related factors (e.g., instructional strategies) (Dyer, Reed, & Berry, 2006; Hover & Pierce, 2006; McDonald & Hannafin, 2003; McGee, 2004; Stellar, 2006; Struyven et al., 2006). Additionally, a great deal of attention has been given to schools that do not meet minimum achievement standards not only by researchers, but also by educators, critics, and the media. However, it has been extremely difficult to find research that addresses schools that are not only meeting minimum standards but are excelling on the tests that measure student achievement. Attention should be given by researchers to schools that strive to excel above and beyond the minimum requirements set by state and national governments and the characteristics those schools possess that are related to their success.

Examining Theoretical and Commentary Literature

Of course, school size is just one of many school characteristics related to student achievement that has been a focus of educational research over the last century. Other factors examined include: socioeconomic status, student-teacher ratio, per-pupil expenditure, and urbanicity.

In order to find a comprehensive source of scholarly articles related to the aforementioned factors, EBSCOhost's Education Research Complete, PsycINFO, and ERIC databases were used to gather relevant literature. All searches were limited to literature that has been peer reviewed. Searches were conducted using the following keywords: achievement, academic achievement, student achievement, advanced proficiency, school size, small schools, large schools, enrollment, per-pupil expenditure, student-teacher ratio, socioeconomic status, urban, rural, suburban, etc. The literature was additionally filtered by searching for literature that contained multiple keywords, particularly literature that contained data regarding school size and one or more of the other factors. Additional articles were found by reviewing the bibliographies in reviewed studies and by recommendation by faculty at the Virginia Polytechnic Institute and State University.

Chapter 2

Review of the Literature

School Size

A number of studies have been reported that have examined the relationship between small schools and various measures of student achievement (Berry, 2004; Black, 2006; Bracey, 2001; Coladarci, 2006; Daresh, 1984; Hylden, 2005; Lee & Smith, 1994; Luyten, 1994; Raywid, 1997). Some researchers have found that size of school has little impact on student achievement while others have determined that small schools have a significant and positive influence on achievement. The following review of the relevant literature highlights some of these findings.

According to a synthesis of research compiled by Raywid (1997), researchers have found that the positive impact that small schools have on students' academic performance is consistently better that the impact of larger schools on student performance. Berry (2004) also found another positive impact of small schools when the researcher examined small and large high schools from a labor-market perspective. Berry discovered that students who attended smaller schools earned significantly larger salaries than students who attended large schools. The findings also revealed that on average, graduates of large schools earned 3.7% less than their small school counterparts. Other researchers have reported different benefits from attending small schools. For example, in a 1994 study, Lee and Smith examined the achievement of more than 11,000 students from 800 high schools across the nation and found that those students who attended small schools performed better academically. Several other researchers have confirmed these findings. Hylden (2005) referenced a 1994 study of over 20,000 students in Philadelphia

and a 1993 survey of 13,000 public school students from Alaska (as cited in Raywid, 1999) that corroborated these findings. Hylden's findings (2005) also indicated that students who attend small schools report a greater level of school satisfaction. Disadvantaged students also reap the benefits of small schools as a result of the personalized attention they receive (Lee & Smith, 1994). The Rural School and Community Trust goes as far as to say that the upper limit of high school enrollment should be 300 (Rural School and Community Trust, 2002). However, Lee and Smith (1997) set an ideal high school enrollment range between 600 and 900 students.

There is a great deal of research to substantiate the claim that students in small schools perform better academically than students in large schools (Coladarci, 2006; Hylden, 2005; Lee & Smith, 1994; Raywid, 1997). However, another group of researchers have found that there is little evidence to support the idea that there is a significant difference in achievement between students of small and large high schools. For example, in a study of schools participating in the Chicago High School Redesign Initiative researchers found that students in small and large high schools performed similarly on state achievement tests (Kahne, Sporte, de la Torrre, & Easton, 2008).

Considering the available research regarding the impact of small schools on student achievement, Hylden's research warrants further examination. Hylden (2005) first examined data reported in studies that indicated that small schools are more successful at educating students than large schools. Secondly, Hylden examined the reasons why small schools were reported to perform better. Hylden then used these conclusions to argue against consolidating small schools in North Dakota. At the time of this research, 2003-04, there was a movement toward consolidating small schools in

North Dakota, despite data that demonstrated that small schools were outperforming large schools.

With an anti-consolidation mindset, Hylden examined the "small school is better" philosophy by conducting a simple analysis using data from the North Dakota Department of Public Instruction (Hylden, 2005). Hylden separated schools by enrollment size into six categories: under 50, 50-100, 101-150, 151-250, 251-500, and over 500. He found that the smallest group of schools in the state outperformed the largest schools in both reading and math proficiency as measured by end-of-grade tests administered in North Dakota. The finding was more evident when socioeconomic status was considered. In reading proficiency, 61.74% of students met minimum standards in the smallest schools (under 50 students) while only 55.44% of students in the largest schools (over 500 students) met the same standards. In math proficiency, 39.25% of students met minimum standards in the smallest schools while 37.25% of students in the largest schools met the same standards. More importantly, of the schools in the smallest category, 41.93% of students were eligible for free or reduced lunch prices, while 25.12% of students attending schools in the largest category were eligible. Hylden concluded that this information demonstrated that smaller schools have a positive impact on students classified as low socioeconomic status. Howley and Howley (2006) confirmed these assertions and credit the increase in student achievement to factors such as the professional collegiality and shared accountability that small schools tend to promote among teachers and staff.

Although advanced student achievement was not considered, a more in depth example of research regarding small schools is a study conducted by Fowler and Walberg

(1991). Fowler and Walberg examined the association among a multitude of educational outcomes with school and district characteristics, specifically, school size effects for secondary schools. Fowler and Walberg regressed 18 school outcomes such as average scores on state-developed high school proficiency tests, minimum basic skills tests, and Scholastic Aptitude Test (SAT) scores on 23 school characteristics some of which were socioeconomic status, school size, district size, and percent of minority students.

Data from 293 public secondary schools in the state of New Jersey were obtained from the New Jersey Department of Education, Bureau of Information Services and the Bureau of Testing. School level test results were only available for schools housing a ninth-grade class that implemented a testing program. Thirty-nine secondary schools from New Jersey did not implement such a program because they primarily served special populations such as handicapped students. The measure of school size was defined as the total enrollment of students in grades 9-12 on September 30, 1984. The average total enrollment of the 293 schools was reported to be 1,070 with the smallest school having an enrollment of 147 and the largest enrollment being 4,018. The socioeconomic measure of the schools was defined as the percentage of enrollment with an annual family income of less than $10,686, which was the national poverty line for a family of four in 1984-85. The average percentage of students meeting this definition was 10% with schools ranging from a 0% to an 88% poverty rate.

In regards to outcomes, the minimum basic skills tests were used to assess reading and mathematics. Outcomes were reported as means for the school and as percentage of students not meeting state standards on one or more tests. High School Proficiency tests, a combination of writing, reading, and mathematics tests, were also considered with

results being reported as percentage of students passing the state standard and as the mean score of each school. SAT scores were reported as a district average for each subtest and the test as a whole.

Once the data set was completed for the 293 schools to be studied, Fowler and Walberg (1991) then conducted a series of backward stepwise regressions, where the least closely associated variable was dropped until all remaining variables were significant at an alpha level of .05. Seven of the 18 variables remained significant and included: percentage of low income students, district socioeconomic status, school size, number of schools in the district, percentage of teachers with a bachelor's degree, student-teacher ratio, and average teacher salary. A summary of the findings revealed that socioeconomic status was the most consistent variable related to student achievement, but school size also had a relationship with the outcomes. District socioeconomic status had a significant and positive association with all but one of the outcomes. School size was the fourth most consistent variable having an association with six of the outcomes. The association between size of school and the percent of students passing the Minimum Basic Skills Test in reading was found to be significant, $R^2 = .6232$, $p < .05$. The association between size of school and the average math score on the High School Proficiency test was also significant, $R^2 = .7422$, $p < .05$. Furthermore, the association between size of school and the average multiple choice writing score on the High School Proficiency test was significant, $R^2 = .7459$, $p < .05$, as was the association between size of school and the percent of students passing the reading test on the High School Proficiency test, $R^2 = .7755$, $p < .05$. In addition, the association between size of school and the percent of students retained was significant, $R^2 = .3407$, $p < .05$. Based on the

findings regarding writing, reading and retention, it is evident that school size was related to student outcomes, but Fowler and Walberg (1991) did not report statistics for multicollinearity.

Lee and Smith (1997) took the school size argument one step further by making specific recommendations about the ideal size of high schools. Lee and Smith used three waves of data from the National Educational Longitudinal Study of 1988 and hierarchical linear modeling methods to examine how students' achievement growth in reading and mathematics during high school was influenced by the size of the high school they attended. Lee and Smith concluded that students learned best in high schools with enrollments between 600-900 students, students learned less in schools with enrollments smaller than 600, and students learned considerably less in schools with enrollments larger than 2100. Additionally, they found that small schools provided more equity, i.e., the relationship between learning and socioeconomic status, than large schools.

However, Howley and Howley (2004) warn that Lee and Smith's (1997) recommendations for ideal school size should not be taken at face value because "the accessible conclusions misrepresent the findings, and … some of the methodological choices limit the generalizability of the findings" (p.7). In other words, Howley and Howley hypothesized that a better conclusion could be drawn from the National Educational Longitudinal Study of 1988 by making adjustments for the large school bias that is evident in the data set, e.g., 77 of the schools in the Lee and Smith (1997) study had eighth grade enrollments under the national median (N= 84) while 724 schools had eighth grade enrollments above the national median (Howley & Howley, 2004). If a

school had fewer than 84 students in eighth grade, it was considered a small school, while schools with more than 84 eighth graders were classified as large schools.

In order to make adjustments for the alleged large school bias, Howley and Howley (2004) separated schools into deciles based on eighth grade enrollments from the same National Educational Longitudinal Study of 1988 data. In addition, Howley and Howley further separated students into socioeconomic quartiles. Using a two-way analysis of variance, Howley and Howley compared the performance in reading, mathematics, science, and history of the poor and affluent students in both small and large high schools across the socioeconomic quartiles. They found that in reading, mathematics, science and history, students in the three lowest socioeconomic quartiles performed better on average in mathematics ($p < .001$), science ($p < .05$), and history ($p < .05$) if the student attended a small school.

The researchers then implemented planned tests of significance of some of the observed mean differences. Comparing the performance of students in the poorest socioeconomic quartile who were enrolled in smaller schools to the performance of other students in the same socioeconomic quartile who were enrolled in larger schools, the researchers found that the poorest students performed significantly better in mathematics, $t = 3.3828$, $p < .01$, $d = .21$, reading, $t = 3.9526$, $p < .01$, $d = .21$, science, $t = 2.9418$, $p < .01$, $d = .19$, and history, $t = 2.7464$, $p < .01$, $d = .18$, when they were enrolled in a small school. Degrees of freedom were not reported in these statistics. Howley and Howley (2004) concluded that students, especially poor students, perform better when they are enrolled in smaller schools. However, contrary to Lee and Smith (1997), Howley and

Howley do not recommend a lower limit for high school enrollment but concluded that the ideal enrollment of 600-900 students proposed by Lee and Smith was too narrow.

Lee (2004) responded to Howley and Howley (2004) by defending the methodologies used in the Lee and Smith (1997) study and accusing Howley and Howley of writing their 2004 article because of their opposing position to Lee in a West Virginia school consolidation court case. The accusatory nature of the researchers' comments has turned the school size issue into more than a scholarly debate.

In sum, Fowler and Walberg (1991) found that school size had a significant positive relationship to academic performance. Lee and Smith (1997) proclaimed that schools with enrollments between 600-900 students perform best. Howley and Howley (2004) contended that schools should be even smaller when socioeconomic status is considered. However, at first glimpse, size of school appears to have a different relationship with regards to recognition in the Virginia Index of Performance incentive program. As mentioned earlier, the smallest schools to receive the highest possible distinction in the first two years of the program had enrollments of over 1,000 students. The absence of small schools in the highest tier of the Virginia Index of Performance incentive program is not consistent with Hylden's (2005) claim that there is evidence that students at small schools perform better on minimum competency tests than do students at large schools. However, the key words in the previous sentence may be "minimum competency" because the Virginia Index of Performance incentive program assigns higher standing to advanced proficiency. Even though, based on the relevant literature reviewed and referenced (Berry, 2004; Fowler & Walberg, 1991; Howley & Howley, 2004; Hylden, 2005; Lee, 2004; Lee & Smith, 1994; Rural School and Community Trust,

2002), small schools appear to offer many advantages in terms of student achievement over large schools, these advantages are not realized in the distribution of awards given by the Virginia Index of Performance incentive program. The variation in performance at the different proficiency levels is a possible gap in practice that researchers need to investigate.

Socioeconomic Status

A common thread in school size research and education research in general is that socioeconomic status needs to be taken into account when examining the relationship between exogenous factors such as school size and student achievement. In relating small schools to socioeconomic status, Tompkins (2006) contends that small schools have been able to counterbalance poverty's impact on student achievement. Tompkins stated the research findings are clear: schools with small enrollments have more impact than large schools on student achievement when poverty is part of the equation. Additionally, a Maine school superintendent and other administrators (Butler et al., 2005) contend that small schools are an antidote to the power of poverty on achievement. The following review of literature will examine both school size and socioeconomic status.

In a study designed to investigate possible relationships between exogenous characteristics (e.g., school size, school poverty level) of Kentucky's public high schools and the equity of student achievement on the math and reading subtests of the state's accountability assessments, Lyons (2004) sampled 220 of the 245 high schools (any school that did not have a 9^{th}-12^{th} grade structure was eliminated) in the Commonwealth of Kentucky. The 2001 results of the math and reading subtests of the Comprehensive Test of Basic Skills version 5 (CTBS-5, a norm-referenced test) and the Kentucky Core

Content Test (KCCT, a criterion-referenced test) in reading and mathematics were used to assess student achievement. For each subtest, the data were disaggregated to show the number of students from each school that scored in each national quartile for the Comprehensive Test of Basic Skills version 5, which is considered to have good validity and reliability (Lyons, 2004, p.15), and the number of students classified as Novice, Apprentice, and Proficient/Distinguished for the Kentucky Core Content Test. (No information was found regarding validity or reliability). School size and socioeconomic status were separated into five categories (see Table 3).

Lyons (2004) found that inequity exists in large high schools for students who are economically disadvantaged as compared to their peers and that small schools provided a more equitable education for students in all socioeconomic classes. Equity or inequity of academic achievement between students living in poverty and their peers was examined using a Chi-square analysis. Lyons implemented a Chi-square analysis to determine whether a significant difference ($p < .05$) existed between the distribution of students on the Comprehensive Test of Basic Skills version 5, measured using national quartiles, or the Kentucky Core Content Test, measured using proficiency level categorization. Schools were then classified as equitable or inequitable depending upon the difference in academic performance between students who were economically challenged and their peers. Lyons found that inequity between students who were economically disadvantaged and their peers existed on the reading and math subtests of the Kentucky Core Content Test, 55.5% and 51.8% respectively. Additionally, the disaggregated results of the Comprehensive Test of Basic Skills version 5 indicated that a majority of high schools in Kentucky did not have equity in reading (64.1%) and math (68.2%) (see Table 4).

Table 3

School Size and Free/Reduced Lunch Prices Categorization

Level	School Size	Free/Reduced Lunch Prices Percentage
1	83 to 417	2.14% to 25.64%
2	420 to 615	26.14% to 35.00%
3	618 to 813	35.09% to 45.12%
4	827 to 1074	45.78% to 58.60%
5	1093 to 2012	58.84% to 92.96%

Table 4

Equity Analysis of Student Achievement

KCCT (criterion-referenced)

		Reading	Math
Equity	# of schools	77	79
	% of schools	35.00%	35.90%
Inequity	# of schools	122	114
	% of schools	55.50%	51.80%

CTBS-5 (norm-referenced)

		Reading	Math
Equity	# of schools	65	57
	% of schools	29.50%	25.90%
Inequity	# of schools	141	150
	% of schools	64.10%	68.20%

Lyons (2004) conducted another Chi-square analysis to determine whether a significant relationship existed between the frequency with which schools were classified as equitable or inequitable and the frequency with which they were designated in either the school size quintiles or the socioeconomic quintiles. As a result of the Chi-square analysis, Lyons (2004) determined that larger schools displayed a significant negative trend in terms of economically disadvantaged students in the reading and math subtests of the Kentucky Core Content Test ($\chi^2 = 23.239$, $p < .001$, and $\chi^2 = 17.285$, $p < .001$ respectively) and the reading and math subtests of the Comprehensive Test of Basic Skills version 5 ($\chi^2 = 40.462$, $p < .001$, and $\chi^2 = 39.610$, $p < .05$, respectively) as compared to schools that were smaller. Degrees of freedom were not reported in these statistics. The results of the analyses were interpreted by Lyons to indicate "…large schools benefit advantaged students at the expense of disadvantaged students" (p. 10). Thus, it would appear that schools with high percentages of students characterized as having low socioeconomic status have challenges that other schools do not face. Lyons contends that small schools can face these challenges better than large schools. However, Lyons (2004) did not address advanced student performance in his research, as the Kentucky Core Content Test recognizes Proficient and Distinguished scores in the same category. As more and more schools place focus on advanced proficiency, the lack of research in the area of advanced student achievement demonstrates a gap in the literature.

Lyons' findings (2004) deserve more study, particularly in the current economic climate where more and more school districts are considering consolidation as a cure for financial woes (National Rural Education Association, 2005). More investigation is needed to understand the nuances of the relationship between a school's size,

socioeconomic status, and level of academic achievement. Moreover, Lyons (2004) suggests that schools should place more emphasis on advanced student achievement: "…equity in the absence of excellence will not bode well under any accountability system." (p. 11).

Urbanicity

Another characteristic of schools that has an impact on academic achievement is location. Truscott and Truscott (2005) contend that students who live in urban and rural settings experience many of the same challenges. According to these researchers, both urban and rural students' achievement is negatively impacted by increased diversity, childhood poverty, residential patterns, financial resources, and teacher retention. This assertion has been supported by the findings reported by Stanley, Comello, Edwards, and Marquart (2008) who concluded that there is no significant difference in the achievement of students in rural and urban areas. Additionally, Grissmer, Flanagan, Kawatka, and Williamson (2000) conducted a study where they performed a regression analysis using location (rural, urban, or suburban) of school and six different achievement indicators; location was not found to be statistically significant with respect to any of the achievement indicators.

Urbanicity research has produced mixed results. For example, Reeves and Bylund (2005) wanted to know whether or not rural schools were inferior to urban schools and addressed the question from an organizational perspective by using accountability data relating to public school accreditation in Kentucky. In addition to making rural and urban school comparisons, they also investigated whether or not schools made academic gains over a five-year period. The researchers did not employ the traditional dichotomous (rural

and urban) or trichotomous (rural, suburban, and urban) school designations. Instead, Reeves and Bylund (2005) used five different location categories (metro, adjacent, large town, small town, and rural), along with district size and school size as variables because anecdotal evidence suggested that larger schools and districts were better at capturing educational resources.

Reeves and Bylund (2005) then used a three-level hierarchical linear modeling analysis to explore the variation within schools, between schools, and between school districts based on five consecutive years of Composite Accountability Index data which measures academic achievement, average daily attendance, drop-out and retention rate, and successful post-secondary transition. Schools in all locations experienced academic growth over the five-year period as depicted in Figure 1, a graph taken directly from Reeves and Bylund. Additionally, the hierarchical linear modeling analysis allowed the researchers to test the main and interaction effects of location on the baseline school performance and on the annual rate of gain. When Reeves and Bylund added the main effect of location to the mean baseline school performance, they found that schools in small town and rural locations performed significantly lower than metro locations with a departure from the mean of -4.1 ($p < .01$) for schools in small towns and a departure from the mean of -5.8 for schools in rural locations ($p < .001$) (see Table 5). However, adjacent and large town locations did not significantly depart from the metro mean performance of 67.3 (p was only reported for significant departures from the mean).

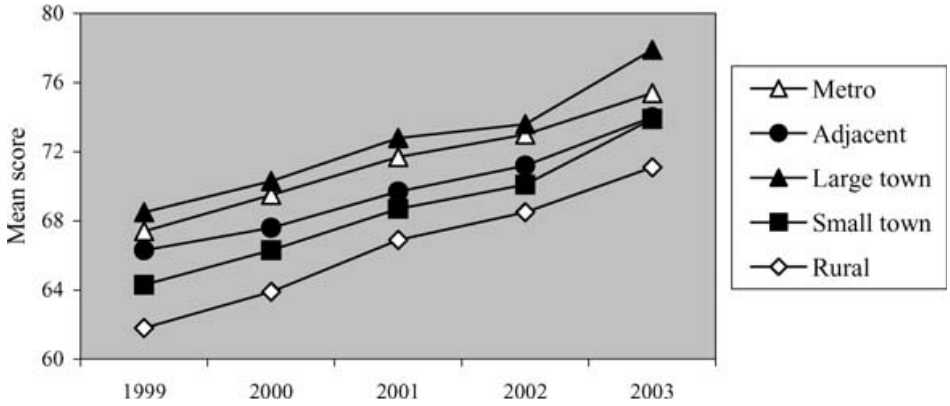

Figure 1. Academic growth of schools in all locations over five years.

Note. Figure 1 is from "Are Rural Schools Inferior to Urban Schools? A Multilevel Analysis of School Accountability Trends in Kentucky," by E.B. Reeves and R.A. Bylund, 2005, Rural Sociology, 70(3), p. 371. Copyright 2005 by the Rural Sociological Society. Reprinted with permission.

Table 5

Effects of School Location on the Mean Baseline Performance Compared to Metro Schools

Location	Departure from the mean
Adjacent	-1.05
Large Town	0.2
Small Town	-4.14**
Rural	-5.77***

*** = $p < .001$, ** = $p < .01$

Conversely, when Reeves and Bylund (2005) considered the effect of location on mean annual gain, a completely different picture was painted. The researchers estimated that schools in rural and small town locations achieved a significant annual gain of .56 (p

< .05) and .53 (p < .01) respectively, above the mean annual gain of metro schools, which was 1.89 (see Table 6). Even though rural schools were still not performing as well academically as schools in other locations, these schools were making stronger gains in academic achievement.

Table 6

Effects of School Location on the Mean Annual Gain Compared to Metro Schools

Location	Mean Annual Gain
Adjacent	-.13
Large Town	.30
Small Town	.53**
Rural	.56*

** = $p < .01$, * = $p < .05$

Howley and Howley (2004) drew similar conclusions with regards to student achievement and urbanicity. As reviewed earlier, Howley and Howley conducted planned tests of significance comparing performance of poor and affluent students in small and large high schools. After making these comparisons, Howley and Howley further analyzed the data by considering the performance of poor and affluent students in large and small high schools that were located in small towns or rural areas. Howley and Howley (2004) found that the differences between socioeconomic quartiles for small and large high schools, while controlling for location of school, were similar to the results they found without controlling for location of school. However, the effect sizes were consistently almost 50% larger for the poorest students when they attended a small school

in a rural or small-town locale. The researchers found that the poorest students performed significantly better in mathematics, $t = 3.4793$, $p < .01$, $d = .29$, reading, $t = 3.8163$, $p < .01$, $d = .27$, science, $t = 3.6404$, $p < .01$, $d = .131$, and history, $t = 3.9084$, $p < .01$, $d = .31$ when they were enrolled in a small school in a rural or small-town locale. Degrees of freedom were not reported for these statistics.

Per-Pupil Expenditure

Per-pupil expenditure is receiving much attention in today's declining economy (Diaz, 2008). Academic achievement has been reported in a number of studies to be related to the amount of money spent on school age children (Alexander, 1998; Archibald, 2006; Fortune, 1993; King & Verstegen, 1998; Ram, 2004). However, Hanushek (1997) has presented evidence that per-pupil expenditure has no significant effect on student achievement on standardized tests. According to Hanushek, only 25% of per-pupil expenditures had a significant positive effect on student performance, while 9% had a negative effect (the significance level was not reported). Archibald has offered a different conclusion based on her 2006 study in which achievement on reading and math posttests was considered. Archibald determined in a three-level fixed effects analysis that per-pupil expenditure had a significant positive effect on reading achievement ($p < .05$), and a positive effect on math achievement, even though the latter was not significant. Additionally, Archibald concluded that school size had a significant negative impact on reading ($p < .05$) and math achievement ($p < .05$).

Like many educational predictors, studies pertaining to per-pupil expenditure appear to provide mixed results. Guthrie and Springer (2007) agree that research in the area of per-pupil expenditure has become increasingly confusing. They suggest that much

of the confusion surrounding per-pupil expenditure research is caused by the different budget developing methods that are implemented. Guthrie and Springer (2007) analyzed two methods used to develop budgets in public education – the cost function approach and the professional judgment approach. Guthrie and Springer concluded that the cost function approach is not a viable budgeting method because it allows researchers to make personal assumptions about inputs and outputs. Guthrie and Springer also criticized the professional judgment approach because the method amounts too little more than guess work. As a result of their criticism of budget developing methods, Guthrie and Springer recommended that changes needed to be made to school budgeting procedures in order for per-pupil expenditure research, both pro- and con-, to have legitimacy. Guthrie and Springer first suggested that a significant investment (i.e., 10-20 million dollars) needed to be made toward the associated research in this area. Secondly, Guthrie and Springer advised that higher evidentiary standards must be agreed upon in order to obtain useful information. Finally, they contended that decisions regarding the development of public school budgets should be made in state legislatures; not in court rooms.

Much like Guthrie and Springer (2007), Alexander (1998) contends that inappropriate research methodologies have caused much confusion in regards to per-pupil expenditure. For example, Alexander mentions a study conducted by Fortune (1993) in which the researcher found a relationship between expenditure and achievement in Ohio and Missouri. Other researchers, including Hanushek, studied the same data and found no significant relationship between per-pupil expenditure and student achievement. The conflicting findings of Fortune, Hanushek, and others led both states to deem their school funding formulas unconstitutional (Alexander, 1998). Furthermore, Alexander criticizes

Hanushek's use of multivariate regression statistics from which a conclusion was drawn that public schools are so inept and ineffective that to allocate any money to the public school system would be irresponsible and wasteful (Hanushek, 1991). Additionally, Alexander (1998) contends that more recent statistical analyses support the notion that public school funding is a moral imperative.

King and Verstegen (1998), in a review of function production research over the preceding 35 years, declare that monetary resources do have an impact on education and there is a positive association with improved student achievement and labor market earnings. A function production describes the maximum possible outcomes from different combinations of inputs (Monk, 1989). King and Verstegen (1998) describe a Hedges, Greenwald, and Laine (1994) study as a comprehensive synthesis of function production research which reported that money is an important input into education. Hedges, Laine, and Greenwald suggested that up to 30% of the collective per-pupil expenditures examined had a significant relationship to student achievement. King and Verstegen also reported that it is not just the dollars that make a difference, but that the inputs that the dollars buy, such as teacher quality and continuous professional development, must also be considered. Finally, King and Verstegen report Baker's (1991) contention that throwing money at schools is a very effective policy; i.e. student achievement improves as more money is spent. However, in a more recent function production study, Imazeki (2006) estimated that in order to achieve state education goals in California, the state would have to spend an additional $1.5 trillion.

Another study (Ram, 2004) that considered per-pupil expenditures did so in a different fashion. Ram used state-level panel data, i.e., used multiple variables over

multiple time periods ("Panel Data," 2007), to consider the relationship between SAT scores and per-pupil expenditure in public schools and allowed a one-year lag time between expenditures and test results. Ram used a fixed effects model by incorporating the following simple achievement (production) function, which is further explained in Table 7:

$$SAT_{it} = a + b(SELECT)_{it} + c(SELECT)_{it}^{2} + d(EXP)_{it-1} + \Sigma_{2}^{51}{}_{ej}D_{j} + U_{it}$$

Ram found that expenditure had a positive effect on the SAT Math score, $t = 4.47$, $R^2 = .98$, $p < .05$ and the SAT total score, $t = 2.76$, $R^2 = .98$, $p < .05$. Per-pupil expenditure also had a positive effect on SAT Verbal performance, although it was statistically insignificant. Degrees of freedom were not reported in these statistics. Even though Ram concluded that per-pupil expenditure had an insignificant effect on the Verbal section of the SAT, he concluded that expenditure had a positive and significant effect on overall performance on the SAT. Ram reported his analysis indicated that for every additional $1000 spent per-pupil, schools can expect a four point gain on the Math portion of the SAT and the combined SAT score. This increase in SAT score would be considered a modest increase in performance (Ram, 2004), but for the student who earns enough extra points to change their college admission status, it would be considered money well spent.

Student-Teacher Ratio

The impact of student-teacher ratio on academic achievement is another educational question that has not been clearly answered despite a plethora of research studies (Alspaugh, 1994; Borland, Howsen, & Trawick, 2005; Odden, 1990).

Table 7

Equation Variables

SAT	Total Score, MATH Score, or VERBAL Score on SAT
i	State
t	Year
EXP	State level current expenditure per pupil in ADA at public elementary and secondary schools in 1994/95 dollars (lagged by 1 year)
D*j*	State-specific intercept (fixed effects) dummy variable that takes the value 1 for state j and 0 for others
u	Well-behaved stochastic error term
SELECT	State average of the percentage of graduates taking the SAT

Despite a lack of research consensus, schools place so much emphasis on student-teacher ratios that they share these ratios on their websites, e.g., http://wcs.k12.va.us/schools/aes. Additionally, the Virginia General Assembly has set aside money to decrease the size of K-3 classrooms statewide in schools where the percent of students who receive free or reduced lunch prices is 30% or more (Virginia Department of Education, June 2009). Schools continue to focus time, energy, and money on reducing student-teacher ratios, despite research studies like the one completed in 1994 in which Alspaugh reported that the results were mixed regarding the impact of class size on student achievement. Alspaugh verified his finding by noting multiple studies that produced the same mixed results. The mixed results issue was also verified by Borland, Howsen, and Trawick (2005).

Borland, Howsen, and Trawick (2005) identified four reasons that the research regarding student-teacher ratio has been mixed and disputed. They contend that class size research is clouded by at least one of the following four reasons;

> (1) the use of a student/teacher ratio as the measure of class size resulting in measurement error; (2) the estimation of a mis-specified model resulting from the failure to control for family effects (i.e., student innate ability); (3) the general failure to take into account the endogeneity of class size with respect to student achievement; and (4) the employment of an incorrect functional form when specifying the relationship between class size and student achievement (Borland, Howsen, & Trawick, 2005, p. 2).

Borland, Howsen, and Trawick attempted to investigate the effect of class size on student achievement, while accounting for the four factors mentioned above by using a statistical model that factored in such variables as student achievement, class size, teacher salary, teacher experience, innate student ability, union presence, student attendance rate, and the percent of college bound students in the district. Noting that students learn from their peers as well as their teachers, Borland, Howsen, and Trawick (2005) expected to find a positive regression coefficient in relation to class size (defined as the number of students for which test scores exist in a particular teacher's class at the end of the academic year), and a negative regression coefficient in relation to class size squared. In other words, Borland, Howsen, and Trawick predicted that as class size gets larger, student achievement would increase as a result of more peer interaction and decrease as a result of less teacher interaction.

With the focus being on the relationship between class size and academic achievement, Borland, Howsen, and Trawick (2005) found, as predicted, that the class size regression coefficients were positive and the regression coefficients for class size squared were negative, each being statistically significant for all five academic subjects (see Table 8). In other words, when class size increases, student achievement increases as well. However, when class size squared increases, there is a decrease in student achievement. Accordingly, Borland, Howsen, and Trawick (2005) concluded that there is a point at which student-teacher ratio reaches an optimal level, indicating that student-teacher ratios can have a negative relationship to student achievement when the ratios are too large or too small.

Borland, Howsen, and Trawick (2005) developed an equation to determine the optimal class sizes for the current set of academic subjects. The optimal class size was determined to be equal to the regression coefficient on class size divided by the product of 2 and the regression coefficient on class size squared, $\beta cs/(2\beta cs^2)$. After applying the dataset to this equation, the researchers found that the optimal class size was between 21.3 and 23.24 students, depending on the academic subject (see Table 8). Additionally, Borland, Howsen, and Trawick found that to lower class size below the equated optimal level would lead to lower student achievement. Thus, Borland, Howsen, and Trawick contend that the student teacher ratio is not as important as the optimal class size for individual subject areas because falling below the optimal class size has a negative impact on student achievement.

Table 8

Results from Student Achievement Equations and Optimal Class Sizes

	Math	Spelling	Reading	Language	Science
Class Size Regression Coefficients	2.6298*	4.133*	3.589*	2.4924*	3.609*
Class Size^2 Regression Coefficients	−0.0583*	−0.096*	−0.084*	−0.054*	−0.080*
Adjusted R^2	0.491	0.277	0.522	0.5178	0.457
n	31,572	31,586	31,573	31,577	30,078
Optimal class size	22.56	21.58	21.3	23.24	22.56

*Significant at the 0.01 level for a one-tailed test

Even though Borland, Howsen, and Trawick (2005) found that small class size is not as important as the optimal class size for student achievement in the individual subjects, they did not investigate the relationship between class size and advanced student achievement. School size in combination with student-teacher ratio was also disregarded in the research. The lack of available research that considers advanced student achievement and class size is another gap in the literature.

Conclusions and Implications

Researchers have reported, more often than not, that there is a positive relationship between small schools and the achievement of the students who attend them, even though there are still questions to be answered (Howley & Howley, 2004; Lee & Smith 1997). For example, there appears to be a gap in the literature in regards to the

relationship between school size and advanced student achievement (Fowler & Walberg, 1991; Hylden, 2005; Lee & Smith, 1994). Additionally, it is not only important to determine if size of school has a relationship with higher level student achievement, but also to determine if other factors, such as percentage of students who receive free or reduced lunch prices, urbanicity, per-pupil expenditures, and student-teacher ratio have a relationship with advanced student achievement (Lyons, 2004; Reeves & Bylund, 2005).

A conceptual framework is presented in Figure 2 that is based on a review of the available research that summarizes the relationships of school size and other factors to student achievement. The conceptual framework illustrates the idea that school size, socioeconomic status, urbanicity, per-pupil expenditures, and student-teacher ratio all have a relationship to advanced student achievement when considered individually. Additionally, the conceptual framework suggests that the relationship between school size and advanced student achievement is impacted by the other four variables.

Purpose Statement

The primary focus of the current study was to determine if there was a relationship between size of high school and advanced academic achievement as measured by the Virginia Index of Performance incentive program while statistically controlling for socioeconomic status, urbanicity of school, per-pupil expenditure, and student-teacher ratio. Additional areas of focus for the present study were to determine if school size and specific combinations of independent variables, as detailed in the Research Questions that follow, had a significant relationship with the level of award on the Virginia Index of Performance incentive program. The combinations of variables

employed in the current study were determined by knowledge gained in the review of the literature.

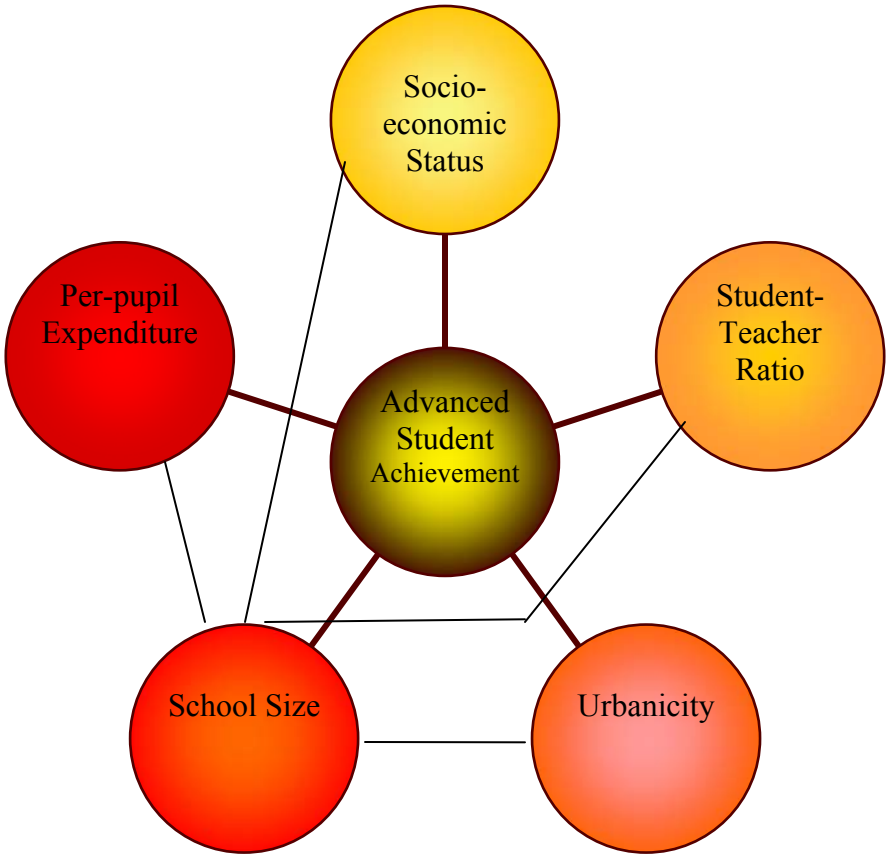

Figure 2. Conceptual Framework.

Research Questions

In order to better investigate the relationship that high school size had with advanced academic achievement while statistically controlling for socioeconomic status,

urbanicity of school, per-pupil expenditures, and/or student-teacher ratio the following Research Questions guided the study:

1. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when socioeconomic status, urbanicity of school, per-pupil expenditures, and student-teacher ratio are statistically controlled?
2. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when only socioeconomic status is statistically controlled? This combination of variables was considered in the current study because the review of the literature strongly indicated that socioeconomic status has a relationship with student achievement (Howley & Howley, 2006; Hylden, 2005; Lyons, 2004; Tompkins, 2006).
3. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when per-pupil expenditures and student-teacher ratio are statistically controlled? This combination of variables was considered in the present study because of the impact that expenditures have on class size and the relationship per-pupil expenditures have with school size (Archibald, 2006).
4. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when socioeconomic status and urbanicity of school are statistically controlled? The final combination of variables was considered in the current

study because the literature review revealed that socioeconomic status and locale, when considered together, have a significant relationship with student achievement (Howley & Howley, 2004).

Chapter 3

Methodology

Introduction

As described in Chapter 2, the main focus of the current study was to determine if there is a relationship between size of high school and advanced academic achievement as measured by the Virginia Index of Performance incentive program while statistically controlling for various combinations of socioeconomic status, urbanicity of school, per-pupil expenditure, and/or student-teacher ratio. This chapter contains an overview of the population studied, definitions of the variables employed in the analysis, data collection procedures implemented, and the methodology used to answer the Research Questions posed in the previous chapter.

Population to be Studied

In 2006-2007 there were 312 public high schools in the Commonwealth of Virginia. The grade configurations of the schools fluctuated from PK-12th to 10th-12th arrangements (Virginia Department of Education, Enrollment and Demographics, 2010). However, data for the current study were only collected for schools with 9th-12th grade configurations because including schools with different grade configurations would make comparisons between schools difficult. For example, a school with an 8th-12th grade configuration would have additional Standards of Learning tests, such as 8th grade Reading and 8th grade Math, considered in the Virginia Index of Performance incentive program calculation. On the other hand, a school with a 10th-12th grade configuration would have fewer Standards of Learning tests, such as Earth Science, considered in the equation for award status. In addition to the difference in the number of tests considered

in the Virginia Index of Performance incentive program calculation for schools with configurations other than 9th-12th grades, there is also a discrepancy between Adequate Yearly Progress calculations for schools with dissimilar grade arrangements. In other words, schools with more grades have more opportunities to be ineligible for an award in the Virginia Index of Performance incentive program and schools with fewer grades are required to meet fewer benchmarks. 148 of the 312 high schools had 9th-12th grade configurations, made Adequate Yearly Progress, and received recognition in the Virginia Index of Performance incentive program. These 148 high schools had enrollments that ranged from 109 9th-12th grade students at Murray High School in Albemarle County, to 3274 9th-12th grade students at Westfield High School in Fairfax County (Common Core of Data, 2009). Table 9 contains summary information about Virginia high schools from 2006-2007 through 2008-2009 and the cohort of schools with 9th-12th grade configurations during the three years that the Virginia Index of Performance Awards have been given (Common Core of Data, 2009; Virginia Department of Education, Enrollment and Demographics, 2010).

Definition of Variables and Collection of Data

Much of the data used in the present study was collected from the Common Core of Data section of the National Center for Education Statistics website (Common Core of Data, 2009). The variables collected from the National Center for Education Statistics included student enrollment, percentage of students who receive free or reduced lunch prices, pupil-teacher ratio, and urban-centric locale. An example of these data is presented in Appendix C. Per-pupil expenditure will also be included in the analysis, but came from Table 15 of the Superintendent's Annual Report for Virginia.

Table 9

2006-2009 Virginia High School Characteristics

	2006-2007 (269 Schools)		2007-2008 (269 Schools)		2008-2009 (263 Schools)	
	High	Low	High	Low	High	Low
Enrollment	3274	109	3213	108	3010	104
Free and Reduced Lunch Price %	82.63%	1.07%	76.01%	.62%	66.35%	.95%
Student-Teacher Ratio	21.7	9.2	31.2	12.3	34.3	11.4
Per-Pupil Expenditure	$18,438	$7,707	$18,449	$7,795	$20,543	$8,585

Per-pupil expenditure is reported by division. (Virginia Department of Education, Superintendent's Annual Report for Virginia, 2010). An example of these data is presented in Appendix D.

Level of award. In order to be initially considered for an award in the Virginia Index of Performance incentive program schools must make Adequate Yearly Progress for two consecutive years. In order to receive the highest level of award in the Virginia Index of Performance incentive program, the Governor's Award, high schools must receive a score of 80 points based on the Virginia Index of Performance formula, have at least 25% of students enrolled in AP or Dual Enrollment courses, have an increase in the number of students earning a career and technical certification, and have at least 57% of students earn an Advanced Diploma. Schools who earn a score of 80 points based on the Virginia Index of Performance formula but fail to meet any of the other three criteria

receive the second highest level of award in the Virginia Index of Performance incentive program, the Excellence Award. In order to receive the next level of award, the Competence to Excellence Award, a school must earn between 75 and 79 points based on the Virginia Index of Performance formula. For the purpose of data analysis, level of award on the Virginia Index of Performance incentive program was designated in the following manner: 1 = Governor's Award, 2 = Excellence Award, and 3 = Competence Award. School level of award was collected from the Virginia Index of Performance – State Level Summary Report, provided by Deborah Jonas, Executive Director for Research and Strategic Planning for the Virginia Department of Education (Jonas, 2010). Sample data from the State Level Summary Report can be found in Appendix E.

School size. School size was defined as the 9th-12th grade enrollment of the school during the year that the Virginia Index of Performance incentive program award was given. Enrollment is determined by the number of students enrolled at each school on September 30th (Virginia Department of Education, Enrollment and Demographics, 2010). School enrollment data were collected from the Common Core of Data section of the National Center for Education Statistics website (Common Core of Data, 2009).

Socioeconomic status. Socioeconomic status was reported as the percentage of students who received free or reduced lunch prices as reported by the Virginia Department of Education during the year the Virginia Index of Performance incentive program award was given. These data are reported to the Virginia Department of Education for each school by its school division based on student eligibility for free or reduced lunch prices on October 31st (Virginia Department of Education, School Nutrition Programs, 2010). Socioeconomic status information was collected from the

Common Core of Data section of the National Center for Education Statistics website (Common Core of Data, 2009).

Student-teacher ratio. Student-teacher ratio was defined as the number of students per teacher in each school. Student-teacher ratio was also collected from Common Core of Data section of the National Center for Education Statistics website (Common Core of Data, 2009).

Urbanicity. Urbanicity for each school was defined as the locale code assigned to the school by the National Center for Education Statistics during the year the award was given for the purpose of data analysis. The National Center for Education Statistics locale code system classifies areas into four major types: city, suburban, town, and rural. There are three subcategories for each of the major types. Cities and suburbs are categorized by size; large, mid-size, and small. Towns and rural areas are categorized by their distance from an urbanized area; fringe, distant, and remote. The complete locale code system is presented in Table 10 (National Center for Education Statistics, 2006). Urbanicity data was also collected from the Common Core of Data section of the National Center for Education Statistics website (Common Core of Data, 2009).

Per-pupil expenditure. Per-pupil expenditure was defined as the average amount of money that a division spends annually on a student. Per-pupil expenditures was reported as the dollar amount reported in Table 15 of the Superintendent's Annual Report for Virginia (see Appendix D) and includes the cost of administration, instruction, attendance and health services, pupil transportation services, and operations/maintenance services for the school division (Virginia Department of Education, Superintendent's Annual Report for Virginia, 2010).

Table 10

NCES Urban-Centric Locale Codes

#	Description	#	Description	#	Description	#	Description
11	Large/City	21	Large/ Suburb	31	Town/ Fringe	41	Rural/ Fringe
12	Medium/ City	22	Medium/ Suburb	32	Town/ Distant	42	Rural/ Distant
13	Small/City	23	Small/ Suburb	33	Town/ Remote	43	Rural/ Remote

Data Analysis

All data collected were suitably coded, accumulated, and managed in a combined Microsoft Excel spreadsheet for every high school in the Commonwealth of Virginia (see Table 11 for an example of what those data look like for a particular high school). Once all data were collected and examined for correctness and completeness, the data were imported into SPSS and examined for outliers and other possible anomalies that could affect the conduct of the analyses and their interpretation.

After verifying that the data were complete and correct, sequential multiple regression analyses were performed with the alpha level being set at .01. The first Research Question was addressed by conducting a sequential multiple regression analysis using level of Virginia Index of Performance incentive program award earned as the dependent variable and school size as the primary predictor variable while statistically controlling for per-pupil expenditure, student-teacher ratio, socioeconomic status, and urbanicity. The second Research Question was examined through the application of a sequential multiple regression analysis using level of Virginia Index of Performance

incentive program award earned as the dependent variable and school size as the primary predictor variable while statistically controlling for socioeconomic status.

Table 11

Sample Data for Patrick Henry High School – Glade Spring

	2006-2007	2007-2008	2008-2009
Level of Award	3	2	3
School Size	478	466	426
Socioeconomic Status	38.28%	39.70%	42.49%
Urbanicity Code	42	42	42
Student-Teacher Ratio	19.0	19.4	16.8
Per-Pupil Expenditure	$8,465	$8,804	$9,510

The data collected relative to the third Research Question were analyzed using a sequential multiple regression analysis where the level of Virginia Index of Performance incentive program award earned served as the dependent variable and school size as the primary predictor variable while statistically controlling for per-pupil expenditure and student-teacher ratio. The final Research Question was addressed through the application of a sequential multiple regression analysis using level of Virginia Index of Performance incentive program award earned as the dependent variable and school size as the primary predictor variable while statistically controlling for socioeconomic status and urbanicity. The possibility existed that the independent variables would be so significantly correlated that it would be difficult to determine which independent variable was a potential predictor of level of award on the Virginia Index of Performance incentive program

(Keith, 2006; Pedhazur, 1997). In order to determine if collinearity was a potential problem, each regression model was examined for collinearity using SPSS collinearity statistics and diagnostics.

Chapter 4

Findings

Introduction

Data were collected, coded, and analyzed for each of the three years (i.e., 2006-07, 2007-08, and 2008-09) that awards have been given as part of the Virginia Index of Performance incentive program. A summary of these data and the associated results of the analyses is offered in this chapter. First, a descriptive summary of the high schools receiving an award is presented. Next, the results of the analyses performed to answer the four Research Questions outlined in Chapter 2 which examine the relationship between size of high school and level of award on the Virginia Index of Performance incentive program when other variables are taken into account statistically are presented. Finally, the chapter concludes with a summary of the findings.

Description of the Schools

Descriptive statistics for the schools receiving Virginia Index of Performance incentive program awards are presented in this section for each of the variables included in the analyses. A sizable group of Virginia high schools were not included in the data analyses because schools are not eligible for an award unless they meet Adequate Yearly Progress for two consecutive years. Additionally, high schools with grade configurations other than 9^{th}-12^{th} grade were excluded. Some high schools receiving awards did not participate in the National School Lunch Program and therefore were also excluded from the analyses involving that variable.

The 2006-07 academic year. In the first year that awards were announced as part of the Virginia Index of Performance incentive program, 148 high schools out of 269

high schools across the Commonwealth that had 9th-12th grade configurations received an award. Fifteen of these schools did not participate in the National School Lunch Program and were excluded from the analyses involving that variable conducted for the 2006-07 academic year. Of the 133 high schools receiving awards that remained, 10 high schools earned the Governor's Award, 47 high schools earned the Excellence Award, and 76 high schools earned the Competence to Excellence Award. Of the 10 schools that received the Governor's Award, six schools were located in a large suburb while the remaining four schools were located in other areas. The Excellence Award was received by 47 schools, 15 of which were located in a large suburb and the remaining schools were distributed among the other Urbanicity Code categories. The Competence to Excellence Award was bestowed on 76 schools where 37 schools were categorized as rural and the remaining 39 schools were distributed among the other Urbanicity Code categories. A summary of the award winners by urbanicity code is presented in Table 12.

The 10 schools that received the Governor's Award had enrollments that ranged from 1,117 to 3,274 students and per-pupil expenditures that fluctuated between $9,034 and $13,068. The percentage of students receiving free and reduced lunch prices for these 10 schools varied from 5.23% to 21.68%, and student-teacher ratios were as low as 12.2:1 and as high as 16.2:1. These summary data are reported in Table 13.

Of the 47 schools that received the Excellence Award, enrollments differed from 109 to 2,881 students, and per-pupil expenditures ranged from $8,161 to $20,269. The percentages of students receiving free and reduced lunch prices for these 47 schools were as small as 1.07% and as large as 55.53%, and student-teacher ratios began at 9.2:1 and peaked at 17.9:1. These summary data are presented in Table 13 as well.

Table 12

Number of Awards Received in Each Locale in 2006-07

Urbanicity Code	Governor's Award	Excellence Award	Competence to Excellence Award
11- Large/City	1	3	6
12 – Medium/City	0	3	3
13 – Small/City	0	2	4
21- Large/Suburb	6	15	11
22-Medium/Suburb	2	2	2
23 – Small/Suburb	0	0	2
31 – Town/Fringe	0	1	3
32 – Town/Distant	0	1	6
33 – Town/Remote	0	0	2
41- Rural/Fringe	1	13	16
42 – Rural/Distant	0	6	16
43 – Rural/Remote	0	1	5
Total	10	47	76

For the 76 schools that received the Competence to Excellence Award, enrollments spanned from 287 to 2,631 students, and per-pupil expenditures differed by over $12,000; $8,103 was the lowest while $20,269 was at the top of the scale. The percentages of students receiving free and reduced lunch prices fluctuated from 8.58% to 52.43%, and

student-teacher ratios were 10:1 at the low end and 19.5:1 at the high end. These summary data are also presented in Table 13.

Table 13

Ranges of School Size, Per-Pupil Expenditure, Pupil-Teacher Ratio, and Socioeconomic Status by Award Level for 2006-07

	Competence to Excellence Award	Excellence Award	Governor's Award
Total Number	76	47	10
Size Min	287	109	1117
Size Max	2631	2881	3274
PPE Min	$8,103	$8,161	$9,034
PPE Max	$20,269	$20,269	$13,068
PTR Min	10.0:1	9.2:1	12.2:1
PTR Max	19.5:1	17.9:1	16.2:1
SES Min	8.58%	1.07%	5.23%
SES Max	52.43%	55.53%	21.68%

Size = School Enrollment, SES = Socioeconomic Status, PTR = Pupil-Teacher Ratio, PPE = Per-Pupil Expenditure

The means and standard deviations for enrollments, per-pupil expenditures, free and reduced lunch price percentages, and student-teacher ratios for all schools to receive an award for the 2006-07 academic year are presented in Table 14.

Table 14

Means and Standard Deviations of Socioeconomic Status, Pupil-Teacher Ratio, Per-Pupil Expenditure, and School Size for 2006-07

	Mean	Standard Deviation	N
Socioeconomic Status	22.91	13.72	133
Pupil-Teacher Ratio	14.71	1.90	133
Per-Pupil Expenditure	$10,533.67	$2,004.52	133
School Size	1,299.96	707.61	133

The 2007-08 academic year. In the second year that awards were announced as part of the Virginia Index of Performance incentive program, 161 high schools out of 269 high schools across the Commonwealth that had 9th-12th grade configurations received an award. Thirteen of these schools did not participate in the National School Lunch Program and were therefore excluded from analyses involving that variable. Data for another school were found to be incorrect and were excluded from analyses as well. Of the 147 high schools receiving awards that remained, 13 high schools earned the Governor's Award, 61 high schools earned the Excellence Award, and 73 high schools earned the Competence to Excellence Award. Of the 13 schools that received the Governor's Award, 10 schools were located in a large suburb while the other 3 schools were located in different locales. The Excellence Award was received by 61 schools, 16 of which were located in a large suburb and the remaining schools were distributed among the other Urbanicity Code categories. The Competence to Excellence Award was

earned by 73 schools where 18 schools were categorized as rural/fringe and the remaining 55 schools were distributed among the other Urbanicity Code categories. A summary of the award winners in 2007-08 by urbanicity code is presented in Table 15.

Table 15

Number of Awards Received in Each Locale in 2007-08

Urbanicity Code	Governor's Award	Excellence Award	Competence to Excellence Award
11- Large/City	0	5	5
12 – Medium/City	0	2	5
13 – Small/City	0	2	4
21- Large/Suburb	10	16	8
22-Medium/Suburb	1	2	3
23 – Small/Suburb	0	3	2
31 – Town/Fringe	0	3	1
32 – Town/Distant	0	4	9
33 – Town/Remote	0	0	1
41- Rural/Fringe	2	14	18
42 – Rural/Distant	0	9	11
43 – Rural/Remote	0	1	6
Total	13	61	73

The 13 schools that received the Governor's Award in 2007-08 had enrollments as small as 1,098 and as large as 3,213 students while per-pupil expenditures fluctuated

between $9,192 and $13,620. The percentages of students receiving free and reduced lunch prices for these 13 schools differed from 0.62% to 20.22%, and student-teacher ratios began at 15.5:1 and went as high as 18.5:1. These summary data are reported in Table 16.

Table 16

Ranges of School Size, Per-Pupil Expenditure, Pupil-Teacher Ratio, and Socioeconomic Status by Award Level for 2007-08

	Competence to Excellence Award	Excellence Award	Governor's Award
Total Number	73	61	13
Size Min	108	167	1098
Size Max	2661	2581	3213
PPE Min	$8,643	$8,643	$9,192
PPE Max	$20,317	$20,317	$13,620
PTR Min	12.7:1	12.6:1	15.5:1
PTR Max	25.6:1	25.9:1	18.5:1
SES Min	8.45%	1.27%	0.62%
SES Max	58.64%	49.79%	20.22%

Size = School Enrollment, SES = Socioeconomic Status, PTR = Pupil-Teacher Ratio, PPE = Per-Pupil Expenditure

Of the 61 schools that received the Excellence Award, enrollments were wide ranging; from 167 students in one school to 2,581 students in another. Per-pupil expenditures were as low as $8,643 and topped out at $20,317. The percentage of students receiving free and reduced lunch prices for these 61 schools varied from almost

non-existent, 1.27%, to 49.79%, while student-teacher ratios were as low as 12.6:1 and as high as 25.9:1. These summary data are also presented in Table 16.

For the 73 schools that received the Competence to Excellence Award, enrollments were diverse, ranging from 108 to 2,661 students. Per-pupil expenditures ranges were similar to previous years, varying from $8,643 to $20,317. The percentages of students receiving free and reduced lunch prices differed at Competence to Excellence schools from 8.45% to 58.64%. Student-teacher ratios were as low as 12.7:1 and as high as 25.6:1 for this group of schools. These summary data are presented in Table 16.

The means and standard deviations for enrollments, per-pupil expenditures, free and reduced lunch price percentages, and student-teacher ratios for all schools to receive an award for the 2007-08 academic year are presented in Table 17.

The 2008-09 academic year. In the third year that awards were announced as part of the Virginia Index of Performance incentive program, the award criteria were changed (Virginia Department of Education, July 2009) and only 80 high schools out of 272 high schools across the Commonwealth that had 9^{th}-12^{th} grade configurations received an award. Four of the schools receiving awards did not participate in the National School Lunch Program and were therefore excluded from the analyses involving that variable. Data for another school were found to be incorrect and were also excluded from the analyses. Of the 75 high schools that remained, six high schools earned the Governor's Award, 16 high schools earned the Excellence Award, and 53 high schools earned the Competence to Excellence Award. Of the six schools that received the Governor's Award, four schools were located in a large suburb while the other two schools were located in other areas. The Excellence Award was received by 16 schools.

Table 17

Means and Standard Deviations of Socioeconomic Status, Pupil-Teacher Ratio, Per-Pupil Expenditure, and School Size for 2007-08

	Mean	Standard Deviation	N
Socioeconomic Status	22.96	13.61	147
Pupil-Teacher Ratio	18.40	2.74	147
Per-Pupil Expenditure	$10,828.29	$2,040.60	147
School Size	1,284.41	694.94	147

Eleven of these schools were located in a large suburb with the remaining award winners being distributed among the other Urbanicity Code categories. The Competence to Excellence Award was conferred on 53 schools where 16 schools were categorized as rural/fringe and the remaining 37 schools were located in other Urbanicity Code categories. A summary of the award winners in 2008-09 by urbanicity code is presented in Table 18.

The six schools that received the Governor's Award in 2008-09 had large discrepancies in enrollment, ranging from 236 to 2,376 students, while per-pupil expenditures were similar to previous years; $9,587 being the lowest expenditure and $13,553 the highest. The percentage of students receiving free and reduced lunch prices for these six schools diverged from 0.95% to 15.25%, and student-teacher ratios were as low as 14.4:1 and as high as 23.2:1. These summary data are reported in Table 19.

Of the 16 schools that received the Excellence Award, enrollments were also wide ranging; between 192 and 2,813 students. Per-pupil expenditures ranged from $9,000 to

$13,601 at schools that received the Excellence Award. The percentage of students receiving free and reduced lunch prices for these 16 schools were a minimum of 1.43% and a maximum of 30.58%, and student-teacher ratios were as low as 11.4:1 and as high as 23.3:1. These summary data are also presented in Table 19.

Table 18

Number of Awards Received in Each Locale in 2008-09

Urbanicity Code	Governor's Award	Excellence Award	Competence to Excellence Award
11- Large/City	0	0	5
12 – Medium/City	0	1	1
13 – Small/City	0	0	1
21- Large/Suburb	4	11	13
22-Medium/Suburb	1	1	1
23 – Small/Suburb	0	0	1
31 – Town/Fringe	0	0	3
32 – Town/Distant	1	0	4
33 – Town/Remote	0	0	0
41- Rural/Fringe	0	3	16
42 – Rural/Distant	0	0	7
43 – Rural/Remote	0	0	1
Total	6	16	53

Table 19

Ranges of School Size, Per-Pupil Expenditure, Pupil-Teacher Ratio, and Socioeconomic Status by Award Level for 2008-09

	Competence to Excellence Award	Excellence Award	Governor's Award
Total Number	53	16	6
Size Min	104	192	236
Size Max	2978	2813	2376
PPE Min	$8,945	$9,000	$9,587
PPE Max	$20,543	$13,601	$13,553
PTR Min	11.4:1	11.4:1	14.4:1
PTR Max	23.7:1	23.3:1	23.2:1
SES Min	3.80%	1.43%	0.95%
SES Max	46.74%	30.58%	15.25%

Size = School Enrollment, SES = Socioeconomic Status, PTR = Pupil-Teacher Ratio, PPE = Per-Pupil Expenditure

For the 53 schools that received the Competence to Excellence Award, enrollment ranges were similar to schools in the other award categories; between 104 and 2,978 students. However, per-pupil expenditures varied from $8,945 to $20,543, much different than schools in the other two award categories. The percentages of students receiving free and reduced lunch prices differed from 3.80% to 46.74% at these 53 schools, while

student-teacher ratios started as low as 11.4:1 and peaked at 23.7:1. These summary data are presented in Table 19 as well.

The means and standard deviations for enrollments, per-pupil expenditures, free and reduced lunch price percentages, and student-teacher ratios for all schools to receive an award for the 2008-09 academic year are presented in Table 20.

Data Analyses

Research Questions 1 and 4 consider urbanicity as an independent variable. Due to the large number of urbanicity code categories being equal to zero (i.e., no schools were coded as belonging to that category), the urbanicity codes were condensed in the following manner for all analyses reported below involving urbanicity:

Categories 11, 12, and 13 were reduced to 1:City

Categories 21, 22, and 23 were compacted to 2:Suburb

Categories 31, 32, and 33 were condensed to 3:Town

Categories 41, 42, and 43 were reduced to 4:Rural.

A sequential multiple regression data analysis procedure (Keith, 2006) was employed to address each Research Question. For each analysis, the collinearity of the predictor variables was examined to ensure that it did not significantly impact the analysis. First, the correlations among the predictor variables were inspected and then tolerance values and Variance Inflation Factors were examined. For each analysis conducted, the independent variable correlations were found to be low to moderate but significant, tolerance was greater than .20, and the Variance Inflation Factor was < 10, indicating that collinearity was not a big concern in the interpretation of any of the analyses that follow (Keith, 2006; Pedhazur, 1997).

Table 20

Means and Standard Deviations of Socioeconomic Status, Pupil-Teacher Ratio, Per-Pupil Expenditure, and School Size for 2008-09

	Mean	Standard Deviation	N
Socioeconomic Status	17.09	11.39	75
Pupil-Teacher Ratio	18.54	2.55	75
Per-Pupil Expenditure	$11,363.57	$1,997.72	75
School Size	1,456.15	713.35	75

Additionally, the potential for collinearity was assessed by looking at the regression coefficients of each of the variables entered into the regression equation for each analysis. If collinearity is a problem, the overall R^2 can be significant but the individual regression coefficients may not be significant (Pedhazur & Schmelkin, 1991). In the current analyses, this condition was not observed, again indicating that collinearity was not an issue.

Data Analyses for Research Question 1

Research Question 1: Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when socioeconomic status, urbanicity of school, per-pupil expenditures, and student-teacher ratio are statistically controlled?

The 2006-07 academic year. Correlations were calculated among all variables in the 2006-07 data set and are reported in Table 21. The analyses revealed significant correlations between level of award on the Virginia Index of Performance incentive

program and three other variables (i.e., school size, socioeconomic status, and per-pupil expenditure), indicating that socioeconomic status and per-pupil expenditure should be taken into account when examining the potential of school size as a predictor of Virginia Index of Performance incentive program level of award.

Table 21

Correlations Between all Variables for Academic Year 2006-07

		VIP	Size	SES	Urban	PTR	PPE
VIP	R	1.000	-.189*	.442**	.143	.145	-.247**
Size	R	-.189*	1.000	-.441**	-.397**	.154	.259**
SES	R	.442**	-.441**	1.000	.179*	-.043	-.158
Urban	R	.143	-.397**	.179*	1.000	.067	-.391**
PTR	R	.145	.154	-.043	.067	1.000	-.416**
PPE	R	-.247**	.259**	-.158	-.391**	-.416**	1.000

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

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

VIP = VIP Award, Urban = Urbanicity, Size = School Enrollment, SES = Socioeconomic Status, PTR = Pupil-Teacher Ratio, PPE = Per-Pupil Expenditure

As per Research Question 1, a sequential multiple regression analysis was implemented to determine how well size of high school could predict Virginia Index of Performance incentive program award level for 2006-07 academic year after taking socioeconomic status, urbanicity of school, per-pupil expenditures, and student-teacher ratio into account. The analysis revealed that school size was not a significant predictor

of award level on the Virginia Index of Performance incentive program when all other independent variables were statistically controlled, $F(1,127) = .242$, $p > .01$, $\Delta R^2 = .001$ (See Table 22).

Table 22

Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status, Urbanicity of School, Per-Pupil Expenditures, and Student-Teacher Ratio into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.507[a]	.257	.234	.556	.257	11.064	4	128	.000
2	.508[b]	.258	.229	.558	.001	.242	1	127	.624

a. Predictors: (Constant), Table15PPE07, FreeandReducedpercent07, StudentTeacherRatio07, Urbanicity07

b. Predictors: (Constant), Table15PPE07, FreeandReducedpercent07, StudentTeacherRatio07, Urbanicity07, Enrollment07

c. Dependent Variable: LevelofAward07

The 2007-08 academic year. Correlations were calculated among all variables in the 2007-08 data set and are reported in Table 23. The analyses revealed significant correlations between level of award on the Virginia Index of Performance incentive program and three other variables (i.e., school size, socioeconomic status, and per-pupil expenditure), indicating that these variables should be taken into account when examining the potential of school size as a predictor of level of award on the Virginia Index of Performance incentive program.

Table 23

Correlations Between All Variables for Academic Year 2007-08

		VIP	Size	SES	Urban	PTR	PPE
VIP	R	1.000	-.254**	.515**	.098	-.048	-.230**
Size	R	-.254**	1.000	-.506**	-.435**	.380**	.263**
SES	R	.515**	-.506**	1.000	.232**	-.235**	-.154
Urban	R	.098	-.435**	.232**	1.000	-.145	-.394**
PTR	R	-.048	.380**	-.235**	-.145	1.000	-.071
PPE	R	-.230**	.263**	-.154	-.394**	-.071	1.000

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

VIP = VIP Award, Urban = Urbanicity, Size = School Enrollment, SES = Socioeconomic Status, PTR = Pupil-Teacher Ratio, PPE = Per-Pupil Expenditure

To examine Research Question 1 for the 2007-08 school year, a sequential multiple regression analysis was conducted to determine how well size of high school could predict Virginia Index of Performance incentive program award level after taking socioeconomic status, urbanicity of school, per-pupil expenditures, and student-teacher ratio into account. The sequential multiple regression analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when all other independent variables were statistically controlled, $F(1,141) = .058$, $p > .01$, $\Delta R^2 = .000$ (see Table 24).

Table 24

Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status, Urbanicity of School, Per-Pupil Expenditures, and Student-Teacher Ratio into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.544[a]	.296	.276	.552	.296	14.926	4	142	.000
2	.544[b]	.296	.271	.554	.000	.058	1	141	.811

a. Predictors: (Constant), Table15PPE08, StudentTeacherRatio08, FreeandReducedpercent08, Urbanicity08

b. Predictors: (Constant), Table15PPE08, StudentTeacherRatio08, FreeandReducedpercent08, Urbanicity08, Enrollment08

c. Dependent Variable: LevelofAward08

The 2008-09 academic year. Correlations were calculated among all variables in the 2008-09 data set and are reported in Table 25. A significant correlation between level of award on the Virginia Index of Performance incentive program and only socioeconomic status was revealed by the analysis, indicating that school size is potentially not a predictor of level of award on the Virginia Index of Performance incentive program.

Again, a sequential multiple regression analysis was conducted to investigate Research Question 1 to determine whether size of high school could predict how well schools perform on the Virginia Index of Performance incentive program after taking socioeconomic status, urbanicity of school, per-pupil expenditures, and pupil-teacher ratio into account using data from fiscal year 2008-09.

Table 25

Correlations Between All Variables for Academic Year 2008-09

		VIP	Size	SES	Urban	PTR	PPE
VIP	R	1.000	-.139	.397**	.204	-.201	-.113
Size	R	-.139	1.000	-.441**	-.320**	.530**	.323**
SES	R	.397**	-.441**	1.000	.340**	-.263*	-.224
Urban	R	.204	-.320**	.340**	1.000	-.009	-.347**
PTR	R	-.201	.530**	-.263*	-.009	1.000	-.011
PPE	R	-.113	.323**	-.224	-.347**	-.011	1.000

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

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

VIP = VIP Award, Urban = Urbanicity, Size = School Enrollment, SES = Socioeconomic Status, PTR = Pupil-Teacher Ratio, PPE = Per-Pupil Expenditure

The sequential multiple regression analysis illustrated that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when all other independent variables were statistically controlled, $F(1,69) = 1.924$, $p > .01$, $\Delta R^2 = .022$ (see Table 26).

Data Analyses for Research Question 2

Research Question 2: Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when only socioeconomic status is statistically controlled?

Table 26

Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status, Urbanicity of School, Per-Pupil Expenditures, and Student-Teacher Ratio into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.434[a]	.188	.142	.585	.188	4.053	4	70	.005
2	.458[b]	.210	.153	.582	.022	1.924	1	69	.170

a. Predictors: (Constant), Table15PPE09, StudentTeacherRatio09, FreeandReducedpercent09, Urbanicity09

b. Predictors: (Constant), Table15PPE09, StudentTeacherRatio09, FreeandReducedpercent09, Urbanicity09, Enrollment09

c. Dependent Variable: LevelofAward09

The 2006-07 academic year. Correlations were calculated among variables in the 2006-07 data set and are reported in Table 21 in the previous section. The analyses revealed significant correlations between level of award on the Virginia Index of Performance incentive program and the two other variables, school size and socioeconomic status. As other researchers have reported (Howley & Howley, 2006; Hylden, 2005; Lyons, 2004; Tompkins, 2006), this finding suggests that socioeconomic status should be taken into account when examining the potential of school size as a predictor of level of award on the Virginia Index of Performance incentive program.

In accordance with Research Question 2, a sequential multiple regression analysis was conducted to determine the predictive power of high school size on Virginia Index of

Performance incentive program award level after taking socioeconomic status into account. The sequential multiple regression analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when socioeconomic status alone was statistically controlled, $F(1,130) = .019$, $p > .01$, $\Delta R^2 = .000$ (see Table 27). However, socioeconomic status was found to be a significant predictor of level of award on the Virginia Index of Performance incentive program, $F(1,131) = 31.813$, $p < .01$, $\Delta R^2 = .195$ (see Table 27).

The 2007-08 academic year. Correlations were calculated among variables in the 2007-08 data set and were reported in Table 23 in the previous section. Significant correlations between Level of Award on the Virginia Index of Performance incentive program and the two other variables considered in Research Question 2, school size and socioeconomic status, were revealed by the analysis indicating that socioeconomic status should be taken into account when examining the potential of school size as a predictor of level of award on the Virginia Index of Performance incentive program.

In order to investigate Research Question 2, a sequential multiple regression analysis was implemented to determine the predictive ability of high school size on Virginia Index of Performance incentive program award level after taking socioeconomic status into account. The sequential multiple regression analysis demonstrated that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when socioeconomic status was statistically controlled, $F(1,145) = .143$, $p > .01$, $\Delta R^2 = .001$ (see Table 28). Conversely, socioeconomic status was found to be a significant predictor of performance on the Virginia Index of Performance incentive program, $F(1,146) = 50.643$, $p < .01$, $\Delta R^2 = .258$ (see Table 28).

Table 27

Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.442[a]	.195	.189	.572	.195	31.813	1	131	.000
2	.442[b]	.196	.183	.574	.000	.019	1	130	.889

a. Predictors: (Constant), FreeandReducedpercent07

b. Predictors: (Constant), FreeandReducedpercent07, Enrollment07

c. Dependent Variable: LevelofAward07

Table 28

Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.507[a]	.258	.252	.560	.258	50.643	1	146	.000
2	.508[b]	.258	.248	.562	.001	.143	1	145	.706

a. Predictors: (Constant), FreeandReducedpercent08

b. Predictors: (Constant), FreeandReducedpercent08, Enrollment08

c. Dependent Variable: LevelofAward08

The 2008-09 academic year. Correlations were calculated among variables in the 2008-09 data set and were reported in Table 25 in the previous section. The analyses revealed a significant correlation between level of award on the Virginia Index of Performance incentive program and only socioeconomic status, which indicates that school size might not have predictive ability in regards to level of award on the Virginia Index of Performance incentive program.

Another sequential multiple regression analysis was executed to determine if size of high school could predict Virginia Index of Performance incentive program award level after taking socioeconomic status into account in conjunction with Research Question 2. The sequential multiple regression analysis demonstrated that size of school was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when socioeconomic status was statistically controlled, $F(1,73) = .300$, $p > .01$, $\Delta R^2 = .004$ (see Table 29). On the other hand, socioeconomic status was found to be a significant predictor of level of award on the Virginia Index of Performance incentive program, $F(1,74) = 12.212$, $p < .01$, $\Delta R^2 = .142$ (see Table 29).

Data Analyses for Research Question 3

Research Question 3: Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when per-pupil expenditures and student-teacher ratio are statistically controlled?

The 2006-07 academic year. Correlations were calculated among selected variables in the 2006-07 data set and were reported in a previous section (see Table 21).

Table 29

Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.376[a]	.142	.130	.589	.142	12.212	1	74	.001
2	.381[b]	.145	.122	.592	.004	.300	1	73	.586

a. Predictors: (Constant), FreeandReducedpercent09

b. Predictors: (Constant), FreeandReducedpercent09, Enrollment09

c. Dependent Variable: LevelofAward09

The analyses revealed significant correlations between school size and per-pupil expenditure and level of award on the Virginia Index of Performance incentive program, suggesting that additional variables should be taken into account when examining the potential of school size as a predictor of level of award on the Virginia Index of Performance incentive program.

As planned, a sequential multiple regression analysis was conducted for Research Question 3 to determine whether or not size of high school could predict Virginia Index of Performance incentive program award level after taking per-pupil expenditures and student-teacher ratio into account. The sequential multiple regression analysis illustrated that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when per-pupil expenditures and student-

teacher ratio were statistically controlled, $F(1,144) = 3.580$, $p > .01$, $\Delta R^2 = .023$ (see Table 30).

Table 30

Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Per-Pupil Expenditures and Student-Teacher Ratio into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.251[a]	.063	.050	.607	.063	4.890	2	145	.009
2	.293[b]	.086	.067	.601	.023	3.580	1	144	.060

a. Predictors: (Constant), StudentTeacherRatio07, Table15PPE07

b. Predictors: (Constant), StudentTeacherRatio07, Table15PPE07, Enrollment07

c. Dependent Variable: LevelofAward07

The 2007-08 academic year. Correlations were calculated among selected variables in the 2007-08 data set and were reported in a previous section (see Table 23). Significant correlations between level of award on the Virginia Index of Performance incentive program and two other variables, school size and per-pupil expenditure were revealed by the analysis, implying that other variables should be taken into account when examining the potential of school size as a predictor of level of award on the Virginia Index of Performance incentive program.

In accordance with Research Question 3, a sequential multiple regression analysis was implemented to determine if size of high school is a potential predictor of overall performance as measured by the Virginia Index of Performance incentive program after

taking per-pupil expenditures and student-teacher ratio into account. Again, the analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when per-pupil expenditures and student-teacher ratio were statistically controlled, $F(1,144) = 6.277$, $p > .01$, $\Delta R^2 = .036$ (see Table 31).

The 2008-09 academic year. Correlations were calculated among selected variables in the 2008-09 data set and were reported in a previous section (see Table 25). The analysis revealed no significant correlations between level of award on the Virginia Index of Performance incentive program and any of the other three variables, school size, pupil-teacher ratio, and per-pupil expenditure indicating that school size is potentially not a predictor of level of award on the Virginia Index of Performance incentive program.

As before, a sequential multiple regression analysis was implemented to determine the predictive ability of school size in regards to Virginia Index of Performance award level after taking per-pupil expenditures and student-teacher ratio into account. The sequential multiple regression analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when per-pupil expenditures and student-teacher ratio were statistically controlled, $F(1,75) = .004$, $p > .01$, $\Delta R^2 = .000$ (see Table 32).

Data Analyses for Research Question 4

Research Question 4: Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when socioeconomic status and urbanicity of school are statistically controlled?

Table 31

Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Per-Pupil Expenditures and Student-Teacher Ratio into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.239[a]	.057	.045	.643	.057	4.749	2	157	.010
2	.306[b]	.094	.076	.632	.036	6.277	1	156	.013

a. Predictors: (Constant), Table15PPE08, StudentTeacherRatio08

b. Predictors: (Constant), Table15PPE08, StudentTeacherRatio08, Enrollment08

c. Dependent Variable: LevelofAward08

Table 32

Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Per-Pupil Expenditures and Student-Teacher Ratio into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.232[a]	.054	.029	.639	.054	2.152	2	76	.123
2	.232[b]	.054	.016	.644	.000	.004	1	75	.947

a. Predictors: (Constant), Table15PPE09, StudentTeacherRatio09

b. Predictors: (Constant), Table15PPE09, StudentTeacherRatio09, Enrollment09

c. Dependent Variable: LevelofAward09

The 2006-07 academic year. Correlations were calculated among selected variables in the 2006-07 data set and were reported in a previous section (see Table 21). School size and socioeconomic status were found to have significant relationships with level of award on the Virginia Index of Performance incentive program, implying that other variables should be taken into account when examining school size as a predictor of level of award on the Virginia Index of Performance incentive program.

In accordance with Research Question 4, a sequential multiple regression analysis was implemented to establish whether or not size of high school can predict Virginia Index of Performance incentive program award level after taking socioeconomic status and urbanicity of school into account. The sequential multiple regression analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when urbanicity and socioeconomic status were statistically controlled, $F(1,129) = .153$, $p > .01$, $\Delta R^2 = .001$ (see Table 33).

The 2007-08 academic year. Correlations were calculated among selected variables in the 2007-08 data set and were reported in a previous section (see Table 23). The analyses revealed significant correlations between Level of Award on the Virginia Index of Performance incentive program and two other variables, school size and socioeconomic status, suggesting that other variables should be controlled for when considering the potential of school size as a predictor of level of award on the Virginia Index of Performance incentive program.

Table 33

Model Summary of Sequential Regression for 2006-07 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status and Urbanicity of School into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.454[a]	.206	.194	.570	.206	16.909	2	130	.000
2	.455[b]	.207	.189	.572	.001	.153	1	129	.696

a. Predictors: (Constant), FreeandReducedpercent07, Urbanicity07

b. Predictors: (Constant), FreeandReducedpercent07, Urbanicity07, Enrollment07

c. Dependent Variable: LevelofAward07

In order to determine if size of high school could predict Virginia Index of Performance incentive program award level after taking urbanicity and socioeconomic status into account the sequential multiple regression analysis prescribed by Research Question 4 was performed. The analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when urbanicity and socioeconomic status were statistically controlled, $F(1,143) = .125$, $p > .01$, $\Delta R^2 = .001$ (see Table 34).

The 2008-09 academic year. Correlations were calculated among selected variables in the 2008-09 data set and were reported in a previous section (see Table 25). These analyses, like the previous three analyses for 2008-09 data, revealed a significant correlation between level of award on the Virginia Index of Performance incentive

program and only socioeconomic status signifying that school size is probably not a predictor of level of award on the Virginia Index of Performance incentive program.

Table 34

Model Summary of Sequential Regression for 2007-08 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status and Urbanicity of School into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.516[a]	.267	.257	.560	.267	26.192	2	144	.000
2	.517[b]	.267	.252	.561	.001	.125	1	143	.724

a. Predictors: (Constant), FreeandReducedpercent08, Urbanicity08

b. Predictors: (Constant), FreeandReducedpercent08, Urbanicity08, Enrollment08

c. Dependent Variable: LevelofAward08

In order to determine how well size of high school could predict Virginia Index of Performance incentive program award level after taking urbanicity and socioeconomic status into account as stipulated by Research Question 4, a sequential multiple regression analysis was implemented. The analysis revealed that school size was not a significant predictor of level of award received on the Virginia Index of Performance incentive program when urbanicity and socioeconomic status were statistically controlled, $F(1,71) = .341$, $p > .01$, $\Delta R^2 = .004$ (see Table 35).

Table 35

Model Summary of Sequential Regression for 2008-09 Academic Year Using School Size to Predict Virginia Index of Performance Award Level after Taking Socioeconomic Status and Urbanicity of School into Account

Model	R	R^2	Adj. R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.420[a]	.176	.153	.581	.176	7.702	2	72	.001
2	.424[b]	.180	.146	.584	.004	.341	1	71	.561

a. Predictors: (Constant), FreeandReducedpercent09, Urbanicity09

b. Predictors: (Constant), FreeandReducedpercent09, Urbanicity09, Enrollment09

c. Dependent Variable: LevelofAward09

Summary

The analyses performed on the data collected over three years to answer the four Research Questions revealed that school size, when other variables were accounted for, was not a significant predictor of performance as measured by the Virginia Index of Performance incentive program incentive program. When the analyses were performed for Research Question 2, however, socioeconomic status was found to be a significant predictor of performance on the Virginia Index of Performance incentive program incentive program.

Chapter 5

Summary and Implications

Introduction

The chapter begins with an overview of the current study. A brief summary of the results of the analyses is presented and then the limitations of the study are discussed. Next the implications of the findings are discussed and suggestions for future research are offered. Finally, the conceptual framework is revised before the final conclusions are presented.

O*verview of the Current Study*

The Virginia Index of Performance incentive program has recognized schools across the Commonwealth of Virginia for advanced academic achievement from 2006-07 through 2008-09. During those three years, 29 high schools have received the highest award given by the Virginia Index of Performance incentive program, the Governor's Award. Only one school out of those 29 had a student enrollment less than 1,000 students. The absence of high schools with small enrollments in the highest tier of achievement in the Virginia Index of Performance incentive program led to the following Research Questions being posed:

1. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when socioeconomic status, urbanicity of school, per-pupil expenditures, and student-teacher ratio are statistically controlled?

2. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when only socioeconomic status is statistically controlled?
3. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when per-pupil expenditures and student-teacher ratio are statistically controlled?
4. Is there a statistically significant relationship between size of high school and level of award on the Virginia Index of Performance incentive program when socioeconomic status and urbanicity of school are statistically controlled?

Summary of the Findings

Size of high school was found to have significant correlations with level of award on the Virginia Index of Performance incentive program for academic years 2006-07 and 2007-08. For academic year 2008-09, high school size was not found to have a significant correlation with level of award on the Virginia Index of Performance incentive program. However, the sequential multiple regression analyses that were performed using the three separate years of data revealed that school size was not a significant predictor of performance on the Virginia Index of Performance incentive program when other variables were taken into account. Even though the absence of high schools with enrollments below 1,000 students on the Governor's Award list appears to be noteworthy, the analyses indicated that size was not a significant predictor of award status for schools eligible to receive the highest award. However, when the analyses were performed for

Research Question 2, socioeconomic status was found to be a significant predictor of the Virginia Index of Performance incentive program award level for each of the academic years that awards have been presented, $F(1,131) = 31.813$, $p < .01$, $\Delta R^2 = .195$, for 2006-07, $F(1,146) = 50.643$, $p < .01$, $\Delta R^2 = .258$, for 2007-08, and $F(1,74) = 12.212$, $p < .01$, $\Delta R^2 = .142$ for 2008-09.

Limitations

Multiple limitations should be noted when interpreting the results of the analyses. The main limitations to the current study were a restricted population of schools due to limitations placed on grade configurations of schools included in the study and the initial Adequate Yearly Progress criteria for receiving an award in the Virginia Index of Performance incentive program. The combination of the grade configuration restrictions and the Adequate Yearly Progress limitations resulted in a large number of schools being excluded from the current study. There were over 300 high schools in the Commonwealth of Virginia in each academic year that Virginia Index of Performance incentive program awards were given. Some schools were not included in the current study because they did not participate in the National School Lunch Program and one school was not included because of incorrect data. However, many of the schools that were excluded from the analyses were left out because they did not have 9^{th}-12^{th} grade configurations. Another large group of schools was not included in the analyses because they did not receive an award in the Virginia Index of Performance incentive program due to their failure to make Adequate Yearly Progress for two consecutive years. When these factors were combined with the Virginia Index of Performance incentive program criteria, the result was that only 133 high schools in 2006-07, 147 high schools in 2007-08, and 75 high

schools in 2008-09 were considered in the analyses. The fact that over half of all high schools in the Commonwealth of Virginia were not included in the analyses in the current study suggests that the studied population was too restricted. Additionally, the urbanicity coding scheme employed in the current study may have placed additional limitations on the utility of the findings.

The first limitation in the current study is a function of the restricted population of schools that were considered. Over the three year period 15% of high schools were excluded from the analyses because they did not have a 9^{th}-12^{th} grade configuration and 83% of those schools (115 out of 139) had enrollments smaller than 1,000 students. For example, there were 44 schools excluded from the analyses in the current study in 2007-08 because they did not have 9^{th}-12^{th} grade configurations and 36 of those schools had enrollments less than 1,000 students (Common Core of Data, 2009). Schools with grade configurations other than 9^{th}-12^{th} were not included in the current study because schools with 8^{th}-12^{th} grade configurations had more end-of-course test results factored into the determination of their award status, while schools with 10^{th}-12^{th} grade configurations administered fewer tests to measure advanced student achievement. In addition to the difference in the number of tests considered to measure advanced student achievement for schools with configurations other than 9^{th}-12^{th} grades, there is also a discrepancy between Adequate Yearly Progress calculations for schools with dissimilar grade arrangements. In other words, schools with more grades, and thus more tests, have additional opportunities to be ineligible and schools with fewer grades are required to meet fewer benchmarks. The implications of the restricted range of the current study will be discussed in detail below.

A second limitation is related to the initial criteria for receiving an award in the Virginia Index of Performance incentive program. Any school that did not meet Adequate Yearly Progress for two consecutive years was automatically ineligible to receive an award in the Virginia Index of Performance incentive program. From 2006-07 to 2008-09, 37% of all high schools that were excluded from the analyses because they failed to meet Adequate Yearly Progress for two consecutive years had enrollments less than 1,000 students. For example, 32 of 85 high schools in 2006-07, 31 of 94 high schools in 2007-08, and 37 of 90 high schools in 2008-09 that did not meet Adequate Yearly Progress for two consecutive years had student enrollments smaller than 1,000 (Jonas, 2010; Common Core of Data, 2009; Virginia Department of Education, Adequate Yearly Progress Reports, 2010).

When small high schools excluded for Adequate Yearly Progress reasons were combined with small schools not included because of grade configuration restrictions the number of small schools included in the study was extremely limited. The exclusion of a large number of small schools from the analyses served to diminish the size range of schools considered in the current study and could have obscured the relationship between size of school and level of award on the Virginia Index of Performance incentive program. The elimination of schools from the current study resulted in less than 45% of high schools in 2006-07, less than 50% high schools in 2007-08, and not quite 25% of high schools in 2008-09 being considered in the analyses, causing the range to be restricted. Pedhazur and Schmelkin (1991) describe the effect of range restriction as a reduction in the magnitude of a correlation due to the process used to select variables. Additionally, when a population has a restricted range, the significance of the interactions

between variables over the entire population can be significantly underestimated (Lewontin, 2006).

Finally, the current study initially suggested the use of the coding format for urbanicity employed by the National Center of Education Statistics. Following that scheme, schools were originally classified into 12 different urbanicity categories. As a result, many urbanicity coding categories contained no schools that were recognized in the Virginia Index of Performance incentive program. In response to this finding, the 12 urbanicity codes were narrowed to four, resulting in a decrease in the number of categories without award winning schools. In 2006-07, there were was a decrease from 10 categories without representation in the original urbanicity categorization to only one in the revised categorization. In 2007-08 there was a reduction from 18 unrepresented urbanicity categories in the initial categorization to only two unrepresented categories in the revised categorization. In 2008-09, three urbanicity categories were without schools in the revised scheme compared to 18 in the original categorization. However, the contraction of the urbanicity coding system may have resulted in an inaccurate reflection of the urbanicity of some schools causing an underestimation of the relationship between urbanicity and advanced student achievement. The possibility that the revised categorization system resulted in urbanicity not being a significant predictor of advanced student achievement is a limitation of the current study.

Implications

The finding that size of school was not significantly related to advanced student achievement when other variables were taken into account is not consistent with much of the available research literature regarding student achievement and small schools (e.g.,

Berry, 2004; Fowler & Walberg, 1991; Hylden, 2005; Lee, 2004; Lee & Smith, 1994; Rural School and Community Trust, 2002). When the findings of the current study are considered in context with previous studies, the implication is that school size may have a relationship with student achievement as measured by minimum competency assessments but not with advanced student achievement as measured by the Virginia Index of Performance incentive program. However, even though school size may only be a predictor of student achievement as measured by minimum competency standards, it should be noted that the findings of the current study are consistent with those reported by other researchers (e.g., Howley & Howley, 2004; Lyons, 2004) in that socioeconomic status was a significant predictor of advanced student achievement as measured by the Virginia Index of Performance incentive program.

One of the implications associated with the limitations of the current study is related to the large number of schools that were excluded from the analyses. Schools were not included in the study because of grade configurations, data errors, lack of participation in the National School Lunch Program, and failure to make Adequate Yearly Progress for two consecutive years. One possible result of excluding a large number of high schools in the Commonwealth of Virginia may have been to restrict the range of variable values used in the analyses. As a result, the relationship between size of school and advanced student achievement could be stronger than the findings suggest.

Suggestions for Future Research

Future research will need to address the restricted range issue that has been identified above in order to gain a better understanding of the relationship between size of school and advanced student achievement. This could be accomplished by examining a

less restricted group of high schools in future analyses, employing measures of advanced student achievement other than the Virginia Index of Performance incentive program, and using an alternative method of capturing urbanicity. Each of these options will be considered in greater detail.

All high schools in the Commonwealth of Virginia should be included in future analyses despite grade configurations or failing to meet the standards of Adequate Yearly Progress. The largest group of schools to be excluded from the current study was the group of schools that did not have a 9^{th}-12^{th} grade configuration. Schools with grade configurations other than 9^{th}-12^{th} were not included in the current study because schools with 8^{th}-12^{th} grade configurations had more end-of-course test results factored into the determination of their award status, while schools with 10^{th}-12^{th} grade configurations had fewer tests to measure advanced student achievement. One possible way to address the issue would be to evaluate the performance of all high schools on end-of-course tests in individual subjects that are only taught and tested in every high school, despite differences in grade configurations, rather than using the Virginia Index of Performance incentive program as a measure of advanced achievement. For example, all high schools test and report results for end-of-course Standards of Learning tests in United States History, Chemistry, Algebra II, and high school Reading. Using results for all high schools from these individual tests would allow researchers to investigate the relationship between size of high school and advanced achievement for every high school in Virginia while using the number of test takers as the indicator of size.

Another option available to study advanced student achievement in relation to high school size would be to consider index scores for all high schools in each of the core

subject areas taught and tested in every high school. For example, achievement in science could be measured by performance on Biology and Chemistry end-of-course tests. The suggestion to consider achievement by individual core subject areas in isolation is offered because in 2008-09, the number of schools receiving awards dropped to 75 from 133 in 2006-07 and from 147 in 2007-08 because the Virginia Department of Education changed the Virginia Index of Performance incentive program award criteria. In 2006-07 and 2007-08 a combination score in the four core areas of English, math, science, and social studies was used to determine award eligibility. In 2008-09, schools had to meet benchmarks in each of the individual core areas in order to be eligible for an award. By considering student achievement in individual subject areas, future researchers could determine if size of school is a significant predictor of advanced student achievement as measured by performance in the individual areas of English, math, science, and/or social studies.

Schools that have not made Adequate Yearly Progress for two consecutive years are not eligible to receive Virginia Index of Performance incentive program awards. The imposition of the eligibility criterion of meeting Adequate Yearly Progress for two consecutive years may distort the picture of overall high school advanced student achievement in the Commonwealth. On the one hand, schools may fail to make Adequate Yearly Progress due to the performance of only one subgroup (Virginia Department of Education, Adequate Yearly Progress Reports, 2010) while on the other hand, it is also possible for schools as a whole to meet the criteria of the Virginia Index of Performance incentive program despite low academic performance by one group of students. By examining advanced student achievement of schools whether or not they meet the

Adequate Yearly Progress criterion required to be eligible for Virginia Index of Performance incentive awards, a clearer picture of the relationship between school size and advanced performance might emerge.

In conducting future studies, researchers should consider a different approach to considering urbanicity as it relates to school size and advanced student achievement. The National Center for Education Statistics reported urbanicity in 12 different categories which were reduced to four categories in the current study. Even though Reeves and Bylund (2005) advocated for increasing the number of urbanicity categories, a more traditional dichotomous (rural or urban) or trichotomous (rural, suburban, urban) coding system may be better suited for a restricted population of schools as in the current study (Reeves & Bylund, 2005). However, in a study with a less restricted population of schools, the National Center for Education Statistics' urbanicity categorization may be more appropriate. Future research could well resolve the issue.

Revising the Conceptual Framework

Even though researchers have often reported that there is a positive relationship between small schools and student achievement (Howley & Howley, 2004; Lee & Smith 1997), within the context of the methodology employed to conduct the current study, size of high school was not found to be a significant predictor of advanced student achievement. However, socioeconomic status was found to be a significant predictor of advanced student achievement. From this standpoint, the conceptual framework that was presented in Chapter 2 seems to only partially reflect the relevant variables that predict awards bestowed by Virginia Index of Performance incentive program. Specifically, school size, urbanicity, per-pupil expenditure, and student-teacher ratio did not predict

award status as anticipated. Despite the fact that the methodology employed to conduct the current study could have distorted the relationships found between the variables investigated, the conceptual framework presented in Chapter 2 needs to be modified to reflect that socioeconomic status was the only variable found to be a significant predictor of advanced student achievement as assessed by the Virginia Index of Performance incentive program. The revised conceptual framework presented in Figure 3 illustrates the idea that school size, socioeconomic status, urbanicity, per-pupil expenditures, and student-teacher ratio all have a relationship to each other but that only socioeconomic status is a significant predictor of advanced student achievement in the Virginia Index of Performance incentive award program.

Conclusions

While the findings of the current study clearly indicate that socioeconomic status is a predictor of advanced student achievement as assessed by the Virginia Index of Performance incentive program and that school size is not, the lack of recognition on the highest tier of the Virginia Index of Performance incentive program for schools with enrollments less than 1,000 students is troubling and merits additional study. Methodology issues (e.g., restricted range) identified in the current study suggest that educators should continue to scrutinize the relationship between size of school and advanced student achievement. The current configuration of the Virginia Index of Performance incentive program makes it difficult to consider the relationship between school size and advanced student achievement because high schools with dissimilar grade configurations administer a different set of Standards of Learning tests.

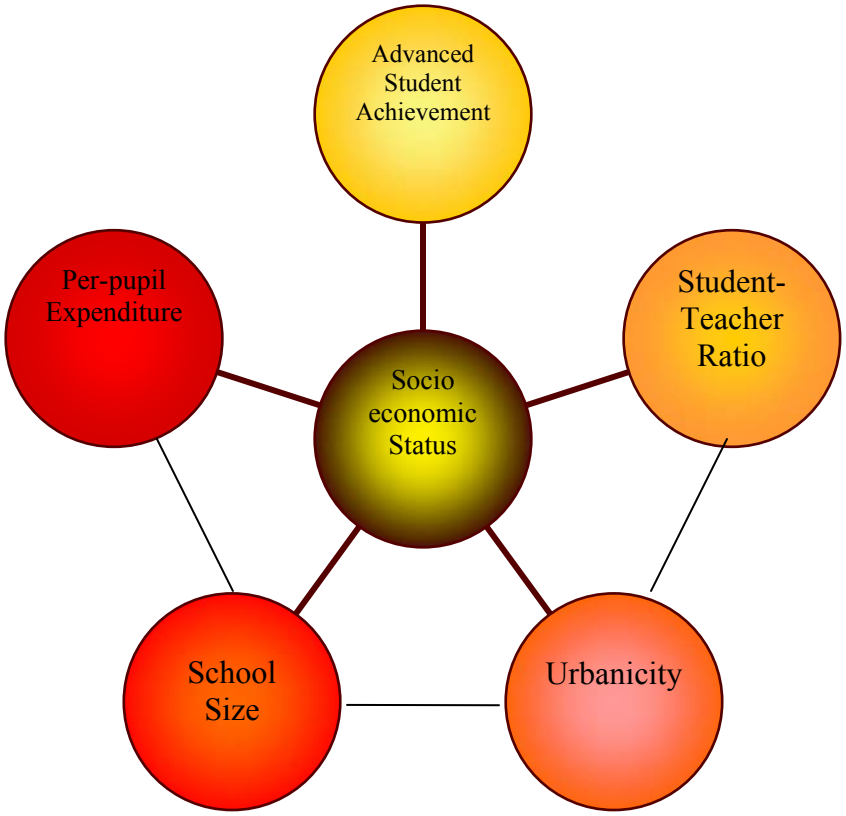

Figure 3. Revised Conceptual Framework.

As a result of these differences, additional measures of advanced student achievement that are consistent for all high schools should be considered in future research. Whether the findings reported here are replicated or not, educators should use the results of this study as motivation to carefully examine the factors related to advanced student achievement in high schools of all sizes.

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APPENDIX A

Virginia Index of Performance Incentive Program Bill

2010 SESSION

ENROLLED

1 Virginia Acts of Assembly - Chapter
2 *An Act to amend the Code of Virginia by adding in Chapter 13.2 of Title 22.1 a section numbered* **3** *22.1-253.13:9, relating to the Virginia Index of Performance incentive program.*
4 [H 1172]
5 Approved
6 Be it enacted by the General Assembly of Virginia:

7 1. That the Code of Virginia is amended by adding in Chapter 13.2 of Title 22.1 a section 8 numbered 22.1-253.13:9 as follows: 9 *§ 22.1-253.13:9. Virginia Index of Performance incentive program.*

10 *A. Schools and local school divisions shall be recognized by the Board of Education in accordance* **11** *with guidelines it shall establish for the Virginia Index of Performance (VIP) incentive program. The* **12** *VIP incentive program shall be designed to recognize and reward fully accredited schools and school* **13** *divisions that make significant progress toward achieving advanced proficiency levels in reading,* **14** *mathematics, science, and history and social science, and on other indicators of school and student* **15** *performance that are aligned with the Commonwealth's goals for public education. Such recognition* **16** *may include:*

17 *1. Public announcements recognizing individual schools and divisions;*
18 *2. Tangible rewards;*
19 *3. Waivers of certain board regulations;*
20 *4. Exemptions from certain reporting requirements; or*
21 *5. Other commendations deemed appropriate to recognize high achievement.* **22** *In addition to Board recognition, local school boards shall adopt policies to recognize individual* **23** *schools through public announcements or media releases as well as other appropriate recognition.* **24** *B. A school that maintains a passing rate on Virginia assessment program tests or additional tests* **25** *approved by the Board of 95 percent or above in each of the four core academic areas for two* **26** *consecutive years may, upon application to the Department of Education, receive a waiver from annual* **27** *accreditation. A school receiving such a waiver shall be fully accredited for a three-year period.* **28** *However, such school shall continue to annually submit documentation in compliance with the* **29** *pre-accreditation eligibility requirements.* **30** *C. Schools may be eligible to receive the Governor's Award for Outstanding Achievement. This* **31** *award will be given to schools rated fully accredited that significantly increase the achievement of* **32** *students within student subgroups in accordance with guidelines prescribed by the Board of Education.*

33 2. That the Board of Education shall include in its guidelines for the VIP incentive program 34 performance objectives and measures that promote student achievement in science, technology, 35 engineering, and mathematics.

E N R O L L E D
HB 117 2ER

APPENDIX B

Virginia Index of Performance (VIP) Point System

Performance Objective	***Performance Measure***
1. Increase the percentage of third graders reading on grade level	*Percentage of students passing the Grade 3 state reading assessment increases annually (95% state goal)*
2. Increase the percentage of students enrolled in Algebra I by grade 8	*Percentage of students enrolled in Algebra I by grade 8 increases annually (45% state goal)*
3. Increase the percentage of high school students taking Advanced Placement, International Baccalaureate, and dual enrollment courses	*Percentage of high school students enrolled in one or more AP, IB, or dual enrollment courses increases annually (25% state goal)*
4. Increase the number of career and technical industry certifications, state licenses, or successful national occupational assessment credentials earned by high school students	*Number of career and technical industry certifications, state licenses, or successful national occupational assessment credentials earned by high school students increases annually or relative to enrollment (15,000 state goal)*
5. Increase the percentage of high school graduates earning an Advanced Studies Diploma	*Percentage of high school graduates earning an Advanced Studies diploma out of the total number of diplomas awarded increases annually (57% state goal)*
6. Increase the percentage of students who receive a high school diploma recognized by the Board of Education	*Percentage of high school students earning a diploma recognized by the Board as compared to ninth-grade enrollment four years earlier increases annually (Target TBD in 2008 using new formula—state interim target 80%)*
7. Increase the percentage of schools that are fully accredited and making Adequate Yearly Progress	*Percentage of fully accredited schools in each division and the percentage of schools in each division making Adequate Yearly Progress increases annually (100% state goal)*
8. Increase the percent of at-risk four-year-olds who are being served by the Virginia Preschool Initiative (VPI)	*Percent of eligible school divisions that participate in the Virginia Preschool Initiative for at-risk four-year-olds increases annually (100% state goal)*
9. Increase the percentage of students achieving at higher levels of proficiency on state assessments	*Percentage of students in each subgroup achieving Advanced Proficient on state assessments increases annually*

10. Increase the percentage of students maintaining literacy proficiency throughout their adolescent years	*Percentages of students passing the Grade 5 state reading assessment and Grade 8 state reading and writing assessments increase annually (95% state goal)*
11. Increase the percentage of schools offering foreign language instruction in the elementary grades	*Percentage of elementary schools offering foreign language instruction increases annually*
12. Increase participation in the Governor's Nutrition and Physical Activity Scorecard Awards Program	*Number of schools that are registered users of the Scorecard and number of schools that earn Governor's awards increases annually*

SOL/State Assessment Scaled Score		***SOL/State Assessment Proficiency Level***	***Points Awarded Each Score***
500-600		Advanced	100
400-499		Proficient	75
Up to 399 (varies by test)		Fail/Basic (Reading and Math 3-8)	25
Below 400 (except Basic)		Fail	0
Other Performance Measures			
School/Division Eligibility	***Performance Measure***		***Points Awarded***
Elementary School Division	*Percentage of students passing the Grade 3 state reading assessment increases annually (95% state goal)*		3 points
Middle School Division	*Percentage of students enrolled in Algebra I by grade 8 increases annually (45% state goal)*		2 points
High School Division	*Percentage of high school students enrolled in one or more AP, IB, or dual enrollment courses increases annually (25% state goal)*		1 point
High School Division	*Number of career and technical industry certifications, state licenses, or successful national occupational assessment credentials earned by high school students increases annually or relative to enrollment (15,000 state goal)*		1 point

High School Division	*Percentage of high school graduates earning an Advanced Studies diploma out of the total number of diplomas awarded increases annually (57% state goal)*	1 point
High School Division	*Percentage of high school students earning a diploma recognized by the Board as compared to ninth-grade enrollment four years earlier increases annually (Target TBD in 2008 using new formula—state interim target 80%)*	1 point
Division	*Percentage of fully accredited schools in each division and the percentage of schools in each division making Adequate Yearly*	1 point
Progress increases annually (100% state goal)		
Division	*Eligible school division participates in the Virginia Preschool Initiative for at-risk four-year-olds (100% state goal)*	1 point
All Schools Division	*Percentage of students in each subgroup achieving Advanced Proficient on state assessments increases annually*	1 point
Elementary and Middle Schools Division	*Percentages of students passing the Grade 5 state reading assessment and Grade 8 state reading and writing assessments increase annually (95% state goal)*	1 point
Elementary School Division	*Percentage of elementary schools offering foreign language instruction increases annually*	1 point
Division All Schools	*Number of schools in the division that are registered users of the Governor's Nutrition and Physical Activity Scorecard includes all schools or increases annually* *Or* *School earns Governor's Nutrition and Physical Activity award*	1 point

APPENDIX C

National Center for Educational Statistics – Sample Data

SCHOOLNAME	URBAN20060 7	URBAN20070 8	Enrollment20 0607	Enrollment20 0708	FR20060 7	PFR0607	FR20070 8	PFR0708	PUPILTEACHERRATIO20 0607	PUPILTEACHERRATIO2 00708	PerPupilExpenditure0607	PerPupilExpenditure0708
EASTERN VIEW HIGH		41		0		#DIV/0!		#DIV/0!			8,599	9,116
TANGIER COMBINED	43	43	95	90	35	36.84%	39	43.33%	8.2	6.9	9,689	10,051
MT. ROGERS COMBINED	43	43	86	97	69	80.23%	72	74.23%	11	9.6	9,361	9,490
MURRAY HIGH	13	13	109	108	7	6.42%	11	10.19%	9.2	13.5	13,810	15,143
HIGHLAND HIGH	43	43	178	161	73	41.01%	66	40.99%	15	13.5	13,048	14,428
OPEN HIGH	12	12	171	167	68	39.77%	64	38.32%	11	167	12,330	12,438
COUNCIL HIGH	43	43	183	170	102	55.74%	97	57.06%	13	12.4	9,745	10,310
ROCKY GAP HIGH	41	41	176	176	65	36.93%	57	32.39%	22	17.4	8,492	8,950
BLAND HIGH	43	43	188	181	57	30.32%	57	31.49%	23	19.5	8,492	8,950
ST. PAUL HIGH	42	42	207	194		0.00%	82	42.27%	15	12.8	8,447	9,044
FRANKLIN MILITARY ACADEMY	12	12	197	202	146	74.11%	138	68.32%	11	14.4	12,330	12,438
ERVINTON HIGH	42	42	232	218	133	57.33%	127	58.26%	18	15.7	9,797	9,762
RICHMOND COMMUNITY HIGH	12	12	220	227	82	37.27%	78	34.36%	11	13.4	12,330	12,438
COLONIAL BEACH HIGH	32	32	249	242	103	41.37%	97	40.08%	18	19.7	9,755	9,386
WEST POINT HIGH	32	32	259	251	41	15.83%	22	8.76%	13	15.5	8,932	9,143
GALILEO MAGNET HIGH	13	13	244	251	73	29.92%	79	31.47%	13	12.6	9,309	9,663
POUND HIGH	42	42	282	252	134	47.52%	121	48.02%	15	14.5	8,447	9,044
HURLEY HIGH	43	43	272	254	207	76.10%	184	72.44%	16	18.7	9,745	10,310
CHARLES CITY CO. HIGH	42	42	259	274	214	82.63%	100	36.50%	11	17.5	13,034	13,226

APPENDIX D

Excerpt from Table 15 of the Superintendent's Annual Report 2009

Attachment A to Supts. Memo No. 071-10
April 2, 2010

Table 15 of the Superintendent's Annual Report for Virginia
Sources of Financial Support for Expenditures, Total Expenditures for Operations [1,8] and Total Per Pupil Expenditures for Operations
Fiscal Year 2009 - Dated 4/2/2010

School Division	End-of-Year ADM for Determining Cost Per Pupil [2]	Local [3] Amount	Local [3] Per Pupil	State Amount	State Per Pupil	State Retail Sales And Use Tax [4] Amount	State Retail Sales And Use Tax [4] Per Pupil	Federal Amount	Federal Per Pupil	Total Expenditures for Operations [3]	Total Per Pupil Expenditure [5]
COUNTIES											
001 Accomack	4,908.07	15,287,088	3,115	24,309,693	4,953	4,792,594	976	5,982,763	1,219	50,372,138	10,263
002 Albemarle	12,599.65	105,256,701	8,354	34,029,869	2,701	11,438,287	908	6,852,474	544	157,577,331	12,506
003 Alleghany	2,811.49	9,720,068	3,457	15,531,490	5,524	2,296,572	817	2,369,597	843	29,917,726	10,641
004 Amelia	1,815.74	4,638,175	2,554	9,572,476	5,272	1,517,607	836	1,621,925	893	17,350,183	9,555
005 Amherst	4,553.25	11,911,994	2,616	26,147,245	5,743	4,090,123	898	3,958,425	869	46,107,786	10,126
006 Appomattox	2,178.37	5,146,692	2,363	12,420,735	5,702	1,907,190	876	1,740,589	799	21,215,206	9,739
007 Arlington	18,597.52	319,602,273	17,185	33,832,115	1,819	16,088,575	865	12,528,108	674	382,051,071	20,543
008 Augusta	10,740.89	35,188,917	3,276	52,121,793	4,853	10,298,027	959	6,065,832	565	103,674,569	9,652
009 Bath	693.48	6,564,854	9,467	1,409,408	2,032	680,193	981	763,983	1,102	9,418,438	13,581
010 Bedford County/City[6]	10,671.63	30,784,372	2,885	49,971,113	4,683	9,154,314	858	6,135,838	575	96,045,638	9,000
011 Bland	929.96	1,061,275	1,141	6,231,406	6,701	737,770	793	787,159	846	8,817,610	9,482
012 Botetourt	4,893.27	20,195,225	4,127	22,486,608	4,595	4,592,168	938	2,408,535	492	49,682,535	10,153
013 Brunswick	2,069.12	5,466,747	2,642	13,241,663	6,400	2,132,207	1,030	3,174,374	1,534	24,014,992	11,606
014 Buchanan	3,255.47	9,177,664	2,819	20,702,637	6,359	2,855,629	877	4,486,542	1,378	37,222,472	11,434
015 Buckingham	1,958.39	6,071,711	3,100	11,609,219	5,928	2,066,820	1,055	2,461,225	1,257	22,208,975	11,340
016 Campbell	8,484.73	19,095,076	2,251	46,840,867	5,521	7,873,230	928	4,889,926	576	78,699,099	9,275
017 Caroline	4,105.98	13,193,915	3,213	18,703,497	4,555	4,290,608	1,045	2,998,000	730	39,186,020	9,544
018 Carroll	3,916.10	8,877,935	2,267	21,978,998	5,612	3,607,064	921	5,383,528	1,375	39,847,525	10,175
019 Charles City	858.16	5,286,391	6,160	4,752,770	5,538	748,940	873	763,041	889	11,551,143	13,460
020 Charlotte	2,069.92	4,382,844	2,117	13,935,679	6,732	1,745,987	844	1,779,378	860	21,843,888	10,553
021 Chesterfield	58,291.48	222,176,981	3,811	264,739,578	4,542	47,382,649	813	24,547,387	421	558,846,596	9,587
022 Clarke	2,166.00	11,769,910	5,434	6,165,478	2,846	1,870,236	863	939,817	434	20,745,441	9,578
023 Craig	697.23	1,968,678	2,824	3,679,132	5,277	696,363	999	567,772	814	6,911,945	9,913
024 Culpeper	7,252.75	30,722,683	4,236	29,481,145	4,065	5,822,896	803	4,178,280	576	70,205,005	9,680
025 Cumberland	1,445.93	3,306,095	2,286	9,245,717	6,394	1,339,126	926	2,309,713	1,597	16,200,651	11,204
026 Dickenson	2,442.64	5,669,524	2,321	16,317,979	6,680	1,896,292	776	2,894,407	1,185	26,778,202	10,963
027 Dinwiddie	4,638.47	11,914,391	2,569	26,933,033	5,806	3,694,984	797	2,813,102	606	45,355,511	9,778
028 Essex	1,605.80	6,112,180	3,806	7,591,367	4,727	1,414,567	881	1,838,999	1,145	16,957,113	10,560
029 Fairfax County/City[6]	166,185.91	1,695,786,317	10,204	313,296,317	1,885	150,007,060	903	93,167,230	561	2,252,256,925	13,553
030 Fauquier	11,113.19	84,160,226	7,573	26,446,092	2,380	10,715,772	964	4,694,002	422	126,016,093	11,339
031 Floyd	2,049.94	5,359,713	2,615	10,862,777	5,299	1,866,477	911	1,415,663	691	19,504,631	9,515
032 Fluvanna	3,645.88	15,683,415	4,302	16,835,915	4,618	2,888,115	792	1,587,910	436	36,995,355	10,147
033 Franklin	7,174.54	26,355,433	3,673	33,946,153	4,731	6,853,079	955	6,514,476	908	73,669,141	10,268
034 Frederick	12,829.13	59,237,416	4,617	56,248,846	4,384	10,436,439	813	5,374,013	419	131,296,714	10,234
035 Giles	2,573.14	5,532,785	2,150	14,972,090	5,819	2,269,725	882	1,609,646	626	24,384,246	9,476
036 Gloucester	5,894.97	23,025,450	3,906	27,309,810	4,633	5,638,621	957	3,630,115	616	59,603,995	10,111
037 Goochland	2,430.46	20,283,065	8,345	3,890,096	1,601	2,058,993	847	1,100,330	453	27,332,485	11,246
038 Grayson	2,007.69	5,353,955	2,667	12,779,948	6,366	2,040,016	1,016	2,372,905	1,182	22,546,825	11,230
039 Greene	2,752.20	9,123,790	3,315	14,487,973	5,264	2,402,648	873	1,644,173	597	27,658,584	10,050
040 Greensville/Emporia[6]	2,562.17	5,174,521	2,020	16,714,993	6,524	2,207,158	861	3,174,858	1,239	27,271,531	10,644
041 Halifax	5,713.99	15,913,037	2,785	35,141,177	6,150	5,375,210	941	5,486,712	960	61,916,136	10,836
042 Hanover	18,641.72	82,822,023	4,443	75,553,527	4,053	16,208,964	869	6,436,980	345	181,021,494	9,711
043 Henrico	48,014.66	182,715,500	3,805	194,094,253	4,042	42,970,009	895	30,056,923	626	449,836,685	9,369
044 Henry	7,214.35	13,678,073	1,896	42,026,287	5,825	7,602,920	1,054	7,989,252	1,107	71,296,531	9,883
045 Highland	257.54	2,114,704	8,211	1,529,274	5,938	269,695	1,047	308,320	1,197	4,221,994	16,394
046 Isle Of Wight	5,325.86	24,722,946	4,642	23,576,612	4,427	5,207,127	978	3,454,702	649	56,961,387	10,695
048 King George	4,007.65	12,600,672	3,144	17,351,772	4,330	2,855,935	713	1,596,922	398	34,405,302	8,585
049 King & Queen	752.52	3,891,313	5,171	4,614,782	6,132	823,088	1,094	1,393,157	1,851	10,722,341	14,249
050 King William	2,122.21	7,324,140	3,451	11,542,433	5,439	1,764,518	831	1,045,948	493	21,677,039	10,214
051 Lancaster	1,321.73	9,658,763	7,308	2,400,697	1,816	1,253,151	948	1,316,931	996	14,629,542	11,068
052 Lee	3,422.82	5,441,433	1,590	26,360,629	7,701	3,424,129	1,000	5,067,082	1,480	40,293,274	11,772
053 Loudoun	56,361.06	563,051,677	9,990	133,840,160	2,375	44,299,426	786	16,769,318	298	757,960,580	13,448
054 Louisa	4,521.75	24,457,531	5,409	15,837,311	3,502	4,159,307	920	2,714,757	600	47,168,906	10,432
055 Lunenburg	1,598.45	3,153,982	1,973	10,105,327	6,322	1,638,736	1,025	2,140,266	1,339	17,038,311	10,659
056 Madison	1,818.66	7,508,382	4,129	7,222,602	3,971	1,757,225	966	1,017,272	559	17,505,480	9,625
057 Mathews	1,249.39	5,736,107	4,591	4,654,060	3,725	1,043,140	835	748,038	599	12,181,344	9,750
058 Mecklenburg	4,595.40	10,033,059	2,183	26,277,227	5,718	3,815,949	830	4,346,693	946	44,472,928	9,678

1

APPENDIX E

State Level Summary Report for the Virginia Index of Performance – 2007-2008

Sample

Begin School Year	Division Name	School Name	VIP Achievement Index Points	VIP Index Score (Max 5)	Total VIP Score	VIP Award (if any)
2007	Accomack County	Nandua High	74	3	77	VIP Competence to Excellence Award
2007	Accomack County	Tangier Combined	80	5	85	VIP Excellence Award
2007	Accomack County	Arcadia High	65	4	69	No Award
2007	Accomack County	Chincoteague High	72	2	74	No Award
2007	Albemarle County	Western Albemarle High	78	4	82	Governor's VIP Award for Educational Excellence
2007	Albemarle County	Albemarle High	79	3	82	VIP Excellence Award
2007	Albemarle County	Murray High	78	4	82	VIP Excellence Award
2007	Alleghany County	Alleghany High	71	2	73	No Award
2007	Amelia County	Amelia County High	71	3	74	No Award
2007	Amherst County	Amherst County High	71	2	73	No Award
2007	Appomattox County	Appomattox County High	71	1	72	No Award
2007	Arlington County	Washington-Lee High	73	3	76	VIP Competence

APPENDIX F

Copyright Permission from the Rural Sociological Society to use Figure 1.

Email from Ralph Brown

Dear Mr. Perrigan: My apologies that this is just now coming to my attention. I am not certain where your request slipped through the cracks. Yes, you certainly may use the figure (From: Reeves, E. B., & Bylund, R. A. (2005). Are rural schools inferior to urban schools? A multilevel analysis of school accountability trends in Kentucky. Rural Sociology, 70(3), 360-386) in your dissertation.

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