The Relationship Between School Building Conditions and Student Achievement at the Middle School Level in the Commonwealth of Virginia

By

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Abstract

The purpose of this study was to investigate the relationship between school building condition and student achievement as measured by their performance on the Standards of Learning (SOL) examinations at the middle school level in the Commonwealth of Virginia.

Three major data components were used to complete this study. The first component was the condition of the school buildings. To obtain this information, principals were asked to complete the Commonwealth Assessment of Physical Environment (CAPE) assessment instrument. The second component was the percentage of passing scores from SOL examinations for each middle school in the Commonwealth of Virginia. The third component was the socioeconomic status of the students attending the schools as measured by the percentage of students participating in the free and reduced lunch program.

Three research questions were used to examine this topic. The first research question examined the differences in the SOL results of students in school buildings rated as standard and substandard. The second research question examined the differences in

the SOL results of students in school buildings rated cosmetically as standard and substandard. The third research question examined the differences in the SOL results of students in school buildings rated structurally as standard and substandard.

This study found that building condition is related to student achievement. Students performed better in newer or recently renovated buildings than they did in older buildings. The percentage of students passing the Commonwealth of Virginia Standards of Learning Examination at the middle school level was higher in English, mathematics and science in standard buildings than it was in substandard buildings. One of the largest differences in percentage of students passing was in English at 6.10 percentage points. This difference was significant at the .05 level of significance. This is noteworthy because student's ability to read affects all other academic areas. Building age, windows in the instructional area, and overall building condition were positively related to student achievement.

Finally the data from this study were compared to the results of earlier studies that examined high schools in the Commonwealth of Virginia, finding that these results were consistent with the findings of other studies.

Acknowledgements

As I near the end of this most challenging and rewarding endeavor, I must remember those who helped and supported me throughout the process. First and foremost I must first thank God, who is the head of my life, for choosing, using, and sustaining me in the mighty way that He did. It is because of Him and the way He orchestrated my life throughout this endeavor that I had the strength to overcome the desire to quit.

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I must thank Dr. Glen Earthman who guided me with such grace and dignity. Dr. Earthman, you will never know the confidence you instilled in me in our very first meeting. You also gave me the encouragement and gentle pushes I needed to keep me going when my spirits got down. Your demeanor had the calming but encouraging effect that I needed as I journeyed through this process. Thank you for sharing your knowledge and expertise with me.

Finally I would like to thank my colleagues who supported and encouraged me throughout this process. Their support and understanding was always refreshing and reassuring when times got hard. Thanks again to everyone for your valuable support.

Dedication

This work is dedicated to my family for the love, support, and understanding they have shown over the last four years. My wife gave continuous support and encouragement throughout the entire process. I truly understand how much of a difference a real family can make. Thank you family.

Table of Contents

List of Figures

List of Tables

List of Tables

List of Tables

List of Tables

CHAPTER 1: THE PROBLEM

Introduction

Since the passage of the No Child Left Behind (NCLB) legislation and the requirement for Adequate Yearly Progress (AYP), school systems across the nation along with architects, planners, and facility professionals have been exploring ways to assist their students in improving their academic performance in their daily classroom activities as well as their scores on high stakes, standardized tests (Gertel, McCarty, & Schoff, 2004). This call for higher standards and accountability is coming from the political arena as well as parents and community members. Parents want to feel comfortable that their children will be able to compete at major universities or in the job market upon completion of high school (Lyons, 2001). Taxpayers want assurance that their tax dollars are being used in the most effective and efficient manner (Crampton, Thompson, & Vesely, 2004).

The call for accountability in the Commonwealth of Virginia has mirrored the call nationwide (DeMary, 2004). In the political arena as well as the private sector, accountability and high stakes testing are at the forefront of the education arena. Since their inception in 1998, the Standards of Learning Tests (SOL) have guided teaching in Virginia (DeMary, 2000). School divisions, building administrators and classroom teachers have been doing everything necessary to ensure student success on the SOLs. The areas that have not received a great deal of attention in the minds of administrators are the buildings in which students learn and teachers teach on a daily basis (Gertel, McCarty, & Schoff, 2004).

Several studies investigating the relationship between student achievement, student behavior, and building condition have been conducted over the past 25 years. In Virginia, Cash (1993), Hines (1996), Lanham (1999), and Crook (2006) used similar methodologies to study large samples of elementary and high schools. Their studies showed a definite relationship between building condition and student success at both the elementary school level and the high school level. The relationship between building condition, student achievement, and student behavior for middle school students in substandard or standard rated buildings has not been studied by Virginia researchers.

Statement of the Problem

This study investigated the relationship between building conditions and student achievement at the middle school level in the Commonwealth of Virginia.

Research Questions

Is there a relationship between student achievement and school building conditions at the middle school level in the Commonwealth of Virginia?

1. Is there a relationship between student achievement and building condition in school buildings that are assessed overall as standard or substandard at the middle school level in the Commonwealth of Virginia?
2. Is there a relationship between student achievement and building condition in school buildings that are assessed cosmetically as standard or substandard at the middle school level in the Commonwealth of Virginia?

3. Is there a relationship between student achievement and building condition in school buildings that are assessed structurally as standard or substandard at the middle school level in the Commonwealth of Virginia?

Significance of the Study

Because parents, community leaders, and politicians are continuing to hold school systems more accountable and education administrators at the local, state, and national levels are seeking ways to enhance the ability of students and teachers to be successful, all avenues of assistance must be explored (Crampton, Thompson & Vesely, 2004). Numerous studies have shown a relationship between the condition of the school facility and student achievement. In Virginia the studies conducted by Cash (1993), Hines (1996), Lanham (1999), and Crook (2006) have shown a relationship at both the elementary and high school levels. Research in this area at the middle school level has been identified in a recent study as an area in need of further exploration (Lanham, 1999). Should the results from the study by this researcher be similar to the results from the Cash (1993), Hines (1996), Lanham (1999), and Crook (2006) studies, this would identify all levels of public education in the Commonwealth of Virginia as showing a relationship between the condition of the school facility and student achievement, thus providing financial and administrative decision makers with the information needed to review and revise the necessary funds allocation policies and/or procedures.

Theoretical Model

The idea that the physical environment of schools affects student learning resonates with policymakers, parents, and the general public (Crampton, Thompson & Vesely, 2004). Several national and state studies have shown that relationships exist

between building condition and student achievement. Cash (1993), Hines (1996), Lanham (1999), and Crook (2006) are recent studies that focused exclusively on Virginia schools and the relationship that exists between building conditions and student achievement. Lemasters' (1997) research synthesis is further evidence of the association between building condition and student achievement. Lemasters synthesized the results of several different studies and concluded that the condition of the school building is in fact associated with student achievement. Crook's (2006) study of Virginia high schools confirmed the findings of the Cash (1993) and Hines (1996) studies that student achievement is associated with building condition.

The theoretical model for this study, shown in Figure 1 below, was first used by Cash (1993) as a guide in the study of the relationship between building and classroom conditions and student achievement in rural high schools in Virginia. The focus of this study will be the relationship between building condition and student achievement. This study will also examine the relationship between the overall, structural, and cosmetic building conditions and student achievement for males and females. The Cash model suggested that the decisions of leadership concerning the maintenance and custodial staffs are also related to building conditions. If leadership places a high priority on the structural and cosmetic conditions of school facilities, they will provide the fiscal resources in the maintenance and custodial areas to ensure that buildings are maintained in top condition. The Cash model also suggested that the combination of existing school facilities, leadership decisions, and the financial ability of the local school districts account for the condition of the buildings in which students receive instruction on a daily basis.

Theoretical Model Design

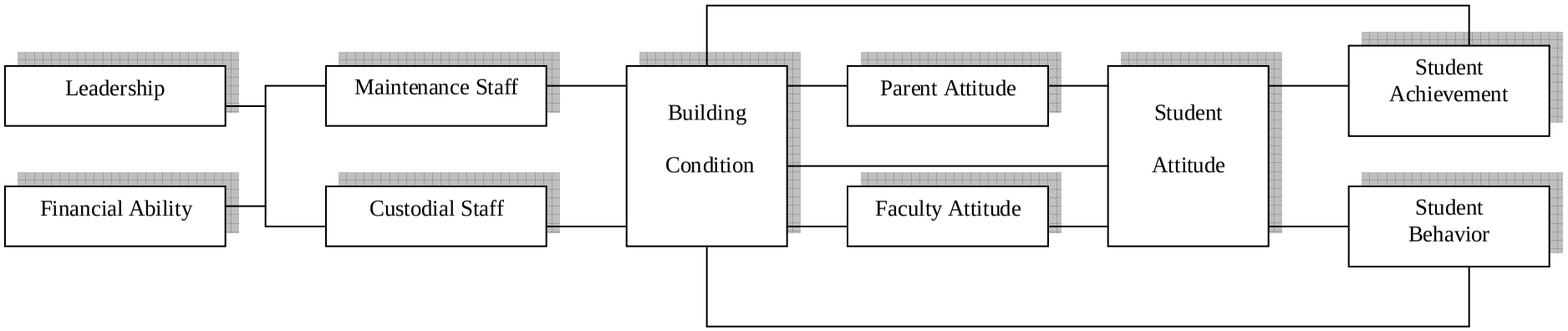

Figure 1

From "*A study of the relationship between school building condition and student achievement and behavior,"* by C. Cash, 1993, unpublished doctoral dissertation, Virginia Polytechnic and State University, Blacksburg. Used with permission.

The financial ability of the local school district is also a major factor in the condition of school facilities. According to Crampton, Thompson and Vesely (2004), few states fund school infrastructure in any meaningful way. “In Virginia, for example, the allocation for maintenance of facilities is very small. The funding is static, as the legislature often lowers the allocations when the budget is tight.” One of the major effects of practices such as this is one called deferred maintenance.

> “Deferred maintenance occurs when the facility owner leaves unperformed planned maintenance, repairs, replacements, and renewal projects due to a lack of resources or a perceived low priority and deferral of the activity results in a progressive deterioration of the facility condition or performance. The cost of the deterioration, including capital cost, operating cost, and productivity losses are expected to increase if the activity continues to be deferred.” *Auditor of Public Accounts Commonwealth of Virginia*, (2005).

According to the Cash model, the condition of the school facilities is indirectly related to student achievement because of its effect on the attitudes of parents, faculty, and students. A well-maintained school building and grounds will send a message to all stakeholders that education is important. This will be the attitude that parents and faculty can pass on to the students. Conversely, a poorly maintained school building and grounds will send the message that education is not important and a negative attitude will be passed on to the students.

Conceptual Framework

The conceptual framework for this study will provide insight into the relationship between building condition and student achievement. First, the relationship between the overall, structural, and cosmetic conditions and student achievement for the entire eighth grade population was examined. Next, the relationship between the overall, structural, and cosmetic conditions and student achievement for the male and female students separately was analyzed. Finally the relationship between the individual components of the building and their relationship to student achievement was investigated.

Limitations

The first limitation of this study is the administration of the Commonwealth of Physical Environment survey instrument. Because it was self administered, principals were asked to complete the instrument about their own school. This could have caused a bias in the responses.

The second limitation was achieving the desired response rate from schools. Many principals may choose not to respond, thereby lowering the number of schools included in the study.

The Standards of Learning (SOL) examination results wasthe third limitation. Schools are required to test a minimum of 95 percent of their students. Therefore, for any given school five percent of the students may not have been tested because of illness, absence, or some other unknown reason. That five percent could cause a school that scored just above the minimum to fail or a school that scored just below the minimum to pass.

The final limitation was the Socio-economic Status (SES) of the students. Qualification for free or reduced lunch is based on household income; however, an application form must be completed and returned to the local school or school district for screening. Some students that would qualify for free or reduced lunch never return the application form; therefore, they were not identified in this category.

Assumptions

The first assumption of this study is that all teachers completed a teacher training program approved by the Commonwealth of Virginia and have been certified and licensed by the Commonwealth to teach. This certification and licensure would indicate that all teachers in the Commonwealth are minimally capable and effective in the classroom.

The second assumption is that all school divisions are using the basic curriculum guides developed by Virginia Department of Education. These curriculum guides have been aligned with the Standards of Learning examinations and are designed to ensure all students in the Commonwealth of Virginia are offered the same basic instruction.

Definitions

1. Deferred Maintenance, for the purposes of this study, occurs when school districts leave unperformed planned maintenance, repairs, replacements, and renewal projects due to a lack of resources or a perceived low priority and deferral of the activity results in a progressive deterioration of the condition of the facility
2. Middle schools, for the purposes of this study, are all schools identified as middle schools by the Department of Education of the Commonwealth of Virginia.

3. Common Assessment of Physical Environment (CAPE), the instrument that was used by local building administrators to determine the condition of their buildings.
4. Overall Building Condition rating is determined by the score obtained from calculating the total number of points based on the responses from the principals to all of the questions on the CAPE used in the scoring process.
5. Structural Building Condition rating is determined by the score obtained from calculating the total number of points based on the responses from the principals to the questions on the CAPE that addressed the age of the building, lockers, ceiling material, science lab equipment, windows, floors, HVAC, lighting, and the roof.
6. Cosmetic Building Condition rating is determined by the score obtained from calculating the total number of points based on the responses from the principals to the questions on the CAPE that addressed the facilities located inside or adjacent to their school building, school grounds, interior and exterior noise levels, interior and exterior wall paint, graffiti, classroom furniture and the sweeping and mopping of the floors.
7. Student Achievement, for the purposes of this study, will be based on student's performance on the SOL examination. The percentage of students passing the SOL in English, mathematics, and science for each building will be used for this study.
8. Socioeconomic Status of the school or the school division, for the purposes of this study, is defined as the ratio of the number of students who receive free or reduced lunch to the number of students in the building or the district.

Organization of the Study

The focus of my study was on the relationship of the condition of school facilities and student achievement as measured by the percentage of eighth grade students passing the SOL examinations in English, mathematics, and science in the Commonwealth of Virginia. Chapter 1 includes an introduction, a statement of the problem, purpose of the study, significance of the study, research questions, theoretical framework, limitations, definitions, and organization of the study.

Chapter 2 includes a review of the literature related to the conditions of school facilities and their relationship to student achievement. The facilities conditions include both structural and cosmetic conditions.

Chapter 3 includes the methodology of the study, background and development of the Commonwealth Assessment of Physical Environment (CAPE) assessment instrument, how the SOLs was used, data gathering, and data analysis.

Chapter 4 includes the findings of the study including an explanation of the data collection and data analysis.

Chapter 5 includes the summary of findings, discussion, conclusion, and implications for further research.

CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

Chapter two gives a review of the research that has focused on the relationships between student achievement and building condition. Several studies have been conducted in various states over the past 30 years investigating the relationship between student achievement and the structural and cosmetic conditions of school facilities. Additionally, several syntheses have been done looking at the research concerning the relationships that exist between student achievement and building condition.

There are some factors that cloud the issue of whether the facilities in which children learn really matter, including the age-old statement that good teachers can teach anywhere, including under a tree. The fact that good teachers can teacher anywhere does not relieve us of our responsibility to provide a safe, secure environment in which all students can learn and all teachers can teach (Moore and Warner, 1998). The question that must be answered, according to Lackney (1999), is "what is the connection between school buildings and education?" Lackney (1999) questions whether it is one of simply housing children and teachers who will get on with their work independent of the condition of the buildings they inhabit? Lackney and other researchers take the view that the factors responsible for student achievement are ecological – they act together as a whole in shaping the context within which learning takes place. The physical environment– the school building – is an undeniably integral part of this ecological context of learning (Lackney, 1999).

Analysis of Research Studies

Studies relevant to the issue of student performance as it relates to building condition includes studies that have examined building condition as it is associated with performance on high stakes testing, using the Commonwealth Assessment of Physical Environment and other measures of building condition. The closing portion of this chapter briefly reviews gender differences in academic performance.

Studies using the CAPE

Cash (1993) examined the relationship between the condition of school facilities and student achievement and behavior. The targeted population for the study was the students in small rural high schools in the Commonwealth of Virginia. Schools that were included in the study were high schools located outside urban areas with a senior class population of less than 100 students. Cash identified a total of 47 high schools to include in her study. Their total student populations ranged in size from 90 to 695 and their senior class populations ranged in size from 12 to 99. The main data elements in the study were school building condition, student achievement, student behavior and the socioeconomic status of the students in the school. School building condition, the independent variable, was determined by data received from the Commonwealth Assessment of Physical Environment (CAPE). The CAPE is a building assessment instrument completed by the building principals giving their evaluation of the school building condition based on the questions asked and the areas covered by the instrument. The information from the CAPE was used to rate buildings overall as substandard, standard, or above standard. The information from the CAPE was also used to rate school buildings cosmetically and structurally as substandard, standard, or above standard. School achievement was

determined by using the average mean scaled scores for the Test of Academic Proficiency (TAP). The TAP was a part of the Virginia State Assessment Program that was administered to all 11th grade students each year. Scores in mathematics, reading comprehension, written expression, information, basic composite, social studies, science and complete composite scores were obtained for this study. The basic composite is an average of the scores on the reading comprehension, mathematics, written expression, and using sources of information tests. The complete composite is an average of scores for social studies and science tests and the four tests that comprise the basic composite. Student behavior, for the purposes of this study, was determined by the ratio of the number of expulsions, suspensions, and violence/substance abuse incidents to the number of students in each school. The entire student population was used in determining student behavior. Socioeconomic status (SES) was determined by the percentage of students who did not qualify for free or reduced lunch. Again the entire student population was used in determining the SES of the school. All of the variables were investigated using analysis of covariance, correlations, and regression analysis. Analysis of covariance was used to compare the adjusted means of schools with different building assessment ratings. Socioeconomic status was used as a covariate to adjust the achievement means and behavior rating means for variance because of SES. Achievement score means were compared to behavior rating means and building age using regression analysis. The researcher found that student achievement scores were higher in schools with better building conditions. Student achievement was related more to the cosmetic condition of the building while student behavior was related more to the structural condition of the

building. The researcher also found that varying climate control, locker condition, and graffiti were factors that were positively related to student achievement.

Hines completed a study in 1996 similar to the Cash study. He examined the relationship between the condition of school facilities and student achievement and behavior in urban high schools in the Commonwealth of Virginia. Schools that were included in the study were high schools located in metropolitan area with populations over 100,000 and school enrollments over 25,000. These metropolitan areas were obtained by identifying the Metropolitan Statistical Areas (MSA) that possessed the desired population. Those areas, according to Hines, were Roanoke, Lynchburg, Norfolk-Virginia Beach-Newport News, Richmond-Petersburg, Charlottesville, Danville, Johnson City-Kingsport-Bristol, and the District of Columbia (Virginia portion). Hines identified a total of 88 high schools to include in his study. Sixty-six of the 88 high schools participated for a 75 percent participation rate. The main data elements in this study, like the Cash study, were school building condition, student achievement, student behavior and the socioeconomic status of the school. School building condition, the independent variable, was determined by data received from the Commonwealth Assessment of Physical Environment (CAPE). The CAPE is a building assessment instrument completed by the building principals giving their evaluation of the school building condition based on the questions asked and the areas covered by the instrument. The information from the CAPE was used to rate buildings overall as substandard, standard, or above standard. The information from the CAPE was also used to rate school buildings cosmetically and structurally as substandard, standard, or above standard. Student achievement was determined by using the average mean scaled scores for the

Test of Academic Proficiency (TAP). The TAP was a part of the Virginia State Assessment Program that was administered to all 11th grade students each year. Scores in mathematics, reading comprehension, written expression, information, basic composite, social studies, science and complete composite scores were obtained for this study. The basic composite is an average of the scores on the reading comprehension, mathematics, written expression, and using sources of information tests. The complete composite is an average of scores for social studies and science tests and the four tests that comprises the basic composite. To analyze the data, analysis of covariance was used to compare the adjusted means of achievement scores with the three building assessment ratings. Several other analyses were conducted. The composite total achievement means from the TAP were compared between the cosmetic building conditions and the structural building conditions of the two groups of buildings. Behavior rating means were compared among the three building condition categories: overall, structural, and cosmetic building conditions. When comparing the results of the urban and rural high schools, he showed that the scaled scores and percentile ranks were higher in urban schools than rural schools in the schools rated as substandard, standard, and above standard. The greatest difference was found in substandard schools where urban schools were 4.65 points and 7 percentile scores higher than rural schools in science. The greatest difference between the schools in the standard area was in mathematics where scores in urban schools were 8.76 scaled scores and 15 percentile ranks higher than rural schools. For schools in the above standards category, scores for the sources of information subtest for students in urban schools were 12.92 scale score points and 15 percentile ranks higher than rural schools while the mathematics subtest was 11.46 scale points and 19 percentile ranks higher.

Lanham completed a study in 1999 similar to the Cash (1993) and Hines (1996) studies. Lanham's study examined the relationship between the condition of school facilities and student achievement and behavior in elementary school students in the Commonwealth of Virginia. Lanham used a random sample of 300 of the 989 elementary schools in Virginia that housed both third and fifth grades students. Of the schools selected, 197 actually participated. The data elements that were used in the Lanham study were building and classroom conditions, student achievement, the socioeconomic status of the schools, and demographic information related to each school. School building condition, the independent variable, was determined by data received from the Commonwealth Assessment of Physical Environment (CAPE). Although the survey was based on the CAPE used in the Cash (1993) study, some modifications were made such as eliminating those items that related strictly to high school and including items that had been developed concerning the availability and use of technology. The information from the CAPE was used to rate buildings overall as either substandard or standard. Student achievement was determined by use of the results of the 1998 Standards of Learning (SOL) examinations given to all third, fifth, eighth graders and in selected high school courses to assess academic achievement. In 1998, third grade SOL test were administered in English, mathematics, science, and social studies. Fifth grade SOL tests were administered in English reading, literature, and research; English writing; mathematics; science; history and social science; and computer technology. The percentage of students passing each test was used to determine student achievement. The number of students participating in the free and reduced lunch program determined socioeconomic status. The entire student population was used to determine the socioeconomic status of the

school using correlations and a step-wise multiple regression analysis to analyze the data. The SOL test results were used as the dependent variable for each multiple regression while the several components of building condition were used as independent variables in the analysis of the data. The finding of this study was that there is a relationship between building condition and student achievement. Some building components were more related to student achievement than others. For instance, air conditioning was a significant variable in third grade English, fifth grade mathematics, and fifth grade technology achievement scores. Other variables found to be significant in one or more of the analyses were ceiling type, frequency of floor sweeping, frequency of floor mopping, connection to a wide-area network, room structure, overall building maintenance, and flooring type. The percentage of students participating in the free and reduced lunch program however, accounted for the largest percentages of variance in English, mathematics, and science SOL scores.

Studies not using the CAPE

Branham (2002) studied the relationship between inadequate school infrastructure and student performance using the 226 schools in Houston Independent School District (HISD) for the 1995-96 school year. The focus of the study was the relationship between problematic school infrastructure and student achievement. According to the author the HISD was the ideal school district for this study. The HISD was represented by schools with groups of students from various ethnic backgrounds. Some schools had a high percentage of students with limited English proficiency (LEP) while other schools had very few LEP students. Additionally there were schools with a high percentage of students from economically disadvantaged families while other schools had a high

percentage of students from affluent families. The final reason the HISD was a good school district for this study was that it had wide variety of levels of infrastructure quality in the schools. Data for this study concerning school infrastructure and enrollment were collected from a study conducted by the Texas Performance Review for the 1995-96 school year (Branham, 2002). Additional data for the individual schools were collected from the HISD Profiles, a yearly publication that contains descriptive data for each school. To assess school infrastructure at individual schools, four specific variables were examined: 1) the amount of temporary space schools used, 2) whether or not the school was in need of roof repair, 3) the number of custodians at the school, and 4) the total amount of facility space per student. Ordinary Least Squares (OLS) regression was used to perform the analysis. Three dependent variables, student attendance percentage, drop out percentage, and the HISD performance rating, were used to measured school performance. The HISD performance is a rating of the school based on the students performance on the Texas Assessment of Academic Skills Tests. The author found that the results of the study provided important evidence that school infrastructure has a critical impact on student achievement. Schools with roofs in need of repair, schools that rely heavily on temporary buildings, and schools with understaffed custodial services provide an environment where students are less likely to attend school and more likely to drop out, as well as an environment of scholastic underachievement. A high quality building brings an atmosphere of high student achievement.

O'Neill (2000) investigated the possible impact of school facilities on student achievement, behavior, attendance, and teacher turnover rates at selected Central Texas middle schools in Region XIII Educational Service Center (ESC) area. The principals of

all 76 middle schools in the area were sent survey packets and invited to participate. The actual number of principals who participated in the study was 70, a 92 percent participation rate. In addition to the survey data, personal interviews were conducted with ten percent of the principals collecting first hand qualitative data concerning the impact of school facilities on student achievement, behavior, attendance, and teacher turnover rate. Data related to student achievement, behavior, attendance, and teacher turnover rate were also obtained through the Texas Education Agency's Division of Communications and Public Information. The researcher collected data concerning teacher turnover rate for the 1996-97, 1997-98, and 1998-99 school years. Data were also collected concerning the economically disadvantaged, average daily attendance and average membership for the 1998-99 school year. Data concerning student attendance, discipline, average membership and percent of economically disadvantaged students represents all students at those schools. Student achievement data however, which was determined by performance on the Texas Assessment of Academic Skills (TAAS), was limited to eighth graders at the participating schools. The instrument created and used for assessment of the school facilities was called the Total Learning Environment Assessment (TLEA). A large portion of the Guide for School Facility Appraisal, an instrument produced by the Council of Educational Facility Planners, International, as a comprehensive method for measuring the quality and educational effectiveness of school facilities was incorporated into the TLEA. The TLEA also included many original items as a result of research on effective educational facilities. The TLEA contained a total of 82 items. The dependent variables of student achievement, behavior, attendance, and teacher turnover rate were investigated using t-tests to compare means across independent variable categories. The

independent categories were the seventeen school facilities (top 25%) with the highest total score on the TLEA compared to the seventeen school facilities (bottom 25%) rated the lowest by total score on the TLEA. The author noted that support data were provided by a series of Pearson product-moment correlations at the question, section, and total score level based on the results of the TLEA responses (O'Neill, 2000). O'Neill (2000) found that for all sections of the Texas Assessment of Academic Skills (TAAS), there was a positive relationship between academic performance and school building condition.

Lair (2003) explored the relationship between school facilities and student achievement as measured by the Texas Assessment of Academic Skills (TAAS) in high performing, high poverty school districts in Texas. This study investigated whether the condition of the school facilities in the Ysleta Independent School District (ISD), located outside El Paso, Texas, was related to the improved student achievement over an eight year period. The Ysleta ISD has a total of 52 school campuses, of which 29 (56 percent) chose to participate: four of the seven high schools, all 11 middle schools, and 14 of the 34 elementary schools. During the 2000 – 2001 school year the student population of Ysleta ISD was 46,394. Of that student population approximately 88 percent, or 40,860, were Hispanic and 73.4 percent, or 34,038, were classified as economically disadvantaged. Three percent of the student population was a combination of African American, Asian, and Native American and less than nine percent of the students were White. The variables examined included building and classroom conditions, the socioeconomic status of the schools, demographics of the schools, schedules of renovation and construction, criteria used to determine priorities regarding district capital expenditures and financial information concerning availability of funds. A variety of

techniques was used to collect data on district priorities, sources of funds and building and classroom conditions including the Commonwealth Assessment of Physical Environment (CAPE). Demographic data used in this study was obtained from the Texas Education Agency's (TEA) demographic data collected in 2001 while the data for student achievement came from the TEA 1994 – 2001 administration of the Texas Assessment of Academic Skills (TAAS) test. A mixed method approach was used for several reasons. First, a mixed method approach was deemed most appropriate due to the small size of the sample and the difficulty realized in studying a connection between the condition of school buildings and student achievement. Secondly, the qualitative method allowed the researcher to study information not available from reports and surveys such as capturing the actual words and thoughts of the decision-makers. Finally, the mixed method approach allowed the researcher to deeply investigate the questions concerning how availability of funds impacted priorities regarding maintenance, renovation, and construction of school facilities. In analyzing the qualitative data, interviews were transcribed and analyzed. Themes were determined and checked for the categorization of information. Descriptive statistical analyzes were conducted (means, standard deviations, frequencies, and percentages) and were in addition to multiple regression analysis. The researcher also noted that backward multiple regression analysis determined how much of the variance in the TAAS scores was accounted for by building age and financial disadvantage of the students. The use of multiple regressions and seemingly unrelated regression (SUR) gave insight into why student achievement might change and indicated the probability that school facilities played a part. The finding of this study supported previous research findings that improvement to facilities can be positively related to

student achievement. The results of this study also supports the research that suggests that renovated buildings send positive messages to students and that these positive messages are related to their performance.

Lewis (2001) studied 139 Milwaukee public schools and examined the association of building condition with student test scores compared to other influences such as family background, socioeconomic status, attendance, race/ethnicity, and student discipline. The study analyzed the performance on the Wisconsin Student Assessment System Mathematics, Science, Language, and Social Studies tests of fourth, eighth, and tenth grades of each school in 1996, 1997, and 1998. The Construction Control Corporation provided the facility scores from information they had for a study done in 1991. The facility score consisted of four separate measures: an Existing Condition Total, Existing Condition Adjusted, Educational Adequacy Total and Educational Adequacy Adjusted. The Existing Condition Total score was based on direct examinations of the schools that were conducted by teams made up of MPS staff from the Department of Facilities and Maintenance Services and staff from the MPS Program Architect. Each school could receive a score of 1000 for the poorest school to 5000 for an excellent school. All other data were provided by Milwaukee Public Schools (MPS) including information about the characteristics of the students who attended the 139 school such as enrollment by racial/ethnic group, attendance, truancy, and suspension rates, mobility and the percent of students eligible for free or reduced lunches. The Educational Adequacy scores were produced by teams composed of teachers and curriculum specialist from the MPS faculty and staff. The schools were rated in the area of conformity, which was the degree to which they conformed to established design standards for each facility type, and

functional performance, which was their adequacy in accommodating current curricula and their capability for alternative use. Conformity, based on established standards, was rated as inadequate, below, equal, above, or exceptional. Functional Performance, also based on established standards, was rated as unacceptable, inferior, average, good, and excellent. The Wisconsin Student Assessment System (WSAS) consists of three sets of standardized tests that are administered to students when they are in fourth, eighth, and tenth grades. The tests reflect student's knowledge in reading, mathematics, language arts (including writing), science, and social studies. These scores, as the facility scores, are converted to standardized scores with a mean of 100 and a standard deviation of 10. The Office of Education Accountability of the Wisconsin Department of Instruction established standards for each grade level and content area that defined four different levels of performance: minimal, basic, proficient, and advanced. The Department of Instruction calculated the percentage of students who performed at or above the proficient level for each school in the state. These percentages were reported for the 139 schools in the Milwaukee Public Schools, and they constituted the student outcome data that were used in the study. The other data elements used in the study were calculated in the following manner. Attendance was the total days of attendance divided by the total possible days of attendance. The denominator for the following four data elements is the total number of students enrolled on the third Friday. Truancy was the number of students absent for either 10 or more consecutive days or 10 or more days in a semester. Suspension was an unduplicated count of the number of students suspended from the school (multiple suspensions for the same student are counted only once per school). Mobility was the total number of students who enter or exited the school after the third

Friday. Free/reduced lunch was the total number of students receiving free or reduced lunch. All of the above elements were converted to standardized scores with a mean of 100 and a standard deviation of 10. Data analysis was completed using multiple regression to provide estimates of the effect of each independent variable upon the dependent while holding the effects of all other variables in the equations constant. This allowed the researcher to isolate the effects of facility condition on test performance while controlling for other factors that might influence student test scores. The strength of the MPS model came from the inclusion of the WSAS Reading test as an independent variable that was regressed against the other WSAS tests as dependent variables. The researcher noted that Reading scores are the most accurate indicators of the ability to do academic work. Including the Reading score as an independent variable increased the explanatory power of the model and the probability of finding statistically significant relationships between the measures of school facilities and the percentage of students in the school that scored at or above the proficient level on the four other tests. The researcher found that student achievement was significantly related to facility condition. One of the surprising findings was that when the differences in the individual ability of students were controlled for, measures of school facilities explained as much of the differences in test performance across schools as indicators of family backgrounds and school attachment. The findings support the findings of previous research that a relationship does exist between student achievement and facility condition.

Pomerantz, Altermatt, and Saxon (2002) studied gender differences in academic performance and internal stress in elementary school children moving into adolescence. The authors noted that girls received higher grades in reading and related subjects, such

as spelling and writing, throughout elementary school and into the adolescent years. One of the factors noted by the authors that may cause girls to outperform boys was the tendency for girls to be more concerned than boys were at pleasing adults, such as parents and teachers. Girls concern may increase their effort to do well, thereby enhancing their performance. Boy's performance, on the other hand, may suffer because they are not as concerned as girls are with pleasing adults. Another factor, according to the authors, that may be related to gender difference in performance is that girls and boys approach achievement situations differently. Girls view achievement situations as an opportunity to gain information about their ability. This view held by girls may increase their effort to do well, thereby increasing their performance because they view their performance as an indicator of their ability as a person. Girls therefore are more receptive of evaluative feedback and will use it to improve their performance. Boys on the other hand are more in tune to the competitive nature of achievement situations, leading them to adopt a self-confident approach, making them less likely to see their performance as a reflection on their ability. Because they do not see performance as a reflection on their ability, they are less likely to exert any extra effort to improve their performance.

In their study of students' perception of classroom activities, Gentry, Gable and Rizza (2002) found that girls typically were more motivated than boys. They noted that middle school students, in general, found their classroom activities to be less interesting and enjoyable, with fewer opportunities for choice. Girls however indicated that their class activities were more frequently interesting and enjoyable than the boys did, which could be contributing to the gender difference in achievement. The authors noted that incorporating more interest, choice, and enjoyment in curricular and instructional

planning at the middle school level may increase satisfaction with school, motivation, and achievement for boys who have consistently lower scores than girls. It may be, according to the authors, that male middle students are also at risk for disliking school in general, which may be contributing to other problems such as declining achievement, behavior problems, and lack of engagement.

Summary

Several studies in various states have shown over the past 30 years that a relationship between building condition and student achievement does in fact exist. Cash (1993) in her study of rural high schools in Virginia found higher achievement in high schools that were rated above standard in the areas of cosmetics and structure. Hines (1996), in his study, found that building condition had an even greater relationship with student achievement in urban high schools in Virginia. The elementary schools in Virginia were the focus of Lanham's (1999) study in which his results were similar to Cash's and Hines'. O'Neill (2000), Branham (2002), and Lair (2003) all completed studies in different school systems in Texas focused on the relationship between building condition and student achievement. All three researchers found student achievement to be higher in modern recently built school buildings and buildings that had been recently renovated and in good condition than in schools in poor condition. Lewis (2001) found similar results in a study done in the Milwaukee Public Schools investigating the relationship between building condition and student achievement. The potential importance of the physical environment in supporting student achievement should not be ignored (O'Neill, 2000). The information can be used by school officials to positively address the issue of student achievement.

Several studies have also been done that addresses differences in academic achievement as it relates to gender. Pomerantz, Altermatt, and Saxon (2002) noted that one of the factors that may contribute to girls outperforming boys is the tendency for girls to try to pleased adults, such as parents and teachers. Boys do not share that same desire to please adults.

Gentry, Gable and Rizza (2002) found that girls were typically more motivated to do well academically than boys. The authors also found that girls usually found classes to be more interesting than boys and that boys have been known to dislike school in general.

CHAPTER 3: METHODOLOGY

Introduction

Chapter three deals with the methodology of the research. Included in this chapter is a description of the population and the rationale used by the researcher in selecting that population. This chapter also contains a discussion of the data needed for this study. A detailed description of the instrument used to collect the data and why this particular instrument was chosen is also discussed. Finally, the procedures used by the researcher for gathering and analyzing the data are discussed.

Population

The targeted population for this study was eighth grade students attending public schools in the Commonwealth of Virginia. For the purposes of this study, a middle school was defined as one serving students in grades not less than fifth and no higher than eighth. The middle school, however, must serve eighth grade students. According to the Virginia Department of Education website, there are 304 middle schools in Virginia.

Variables

The data needed for this study were information regarding student achievement, the socio-economic status of the students attending each school, and the condition of school facilities. Building condition was determined by an analysis of data obtained through the use of the Commonwealth Assessment of Physical Environment (CAPE) survey.

Student Achievement

Student achievement was determined by using the percentage of eighth grade students passing the spring 2006 SOL Examination in English, mathematics, and science.

The Virginia Department of Education administers, through the local school divisions, the SOL examinations to all eighth students attending public schools.

The four subject areas tested are English, mathematics, science, and social studies. Social studies test scores were not used in this study because of the different methods used to test middle students in social studies. In social studies, school divisions had the option of using one of two methods to test their middle school students. They could use Content Specific History Tests where each grade level was tested on the material from that specific grade level or they could use the Cumulative History Test where only eighth grade students were tested using a comprehensive test covering sixth, seventh, and eighth material. Students had to score a minimum of 400 out of a possible 600 points to earn a passing score on each individual test. A minimum of 70% of the students tested in a school must past all four examinations for that school to receive state accreditation. Achieving the Adequately Yearly Progress (AYP) component of No Child Left Behind (NCLB) is also associated with the number of students who pass the SOL examinations.

The Virginia Department of Education (VDOE) maintains the SOL examination results of all schools in the Commonwealth of Virginia. The tests were developed and scored by Harcourt Testing services. Once the tests were scored, the results were passed on to the Virginia Department of Education. The percentage of students passing the SOL Examinations in English, mathematics, and science was used for this study. The percentage of students passing in each subject area in each building was assessed and the percentage of students passing who attended schools identified as standard was compared to the percentage of students passing who attended schools identified as substandard.

Socio-Economic Status

Socio-economic status was determined by the number of students participating in the free and reduced lunch program compared to the total numbers of students attending the school. This information was obtained from the VDOE website. As in the Crook (2006) study, the percentage of free and reduced lunch participants was used as a covariant when examining the relationship between student achievement and building condition.

Commonwealth Assessment of Physical Environment

Earthman (1998) noted that an appraisal instrument needed to be developed to determine whether school buildings had certain qualities or factors that represented favorable conditions for learning. The Commonwealth Assessment of Physical Environment (CAPE), which was developed to determine whether school buildings had certain qualities or factors that represented favorable conditions for learning, was used in this study. Earthman stated that, in developing the Commonwealth Appraisal of Physical Environments (CAPE) used in Virginia and the subsequent State Appraisal of Facilities in Education (SAFE) used in North Dakota, it was necessary to create an instrument that could adequately discriminate between buildings in poor condition and good condition. Items for the instruments were constructed from most of the categories identified by McGuffey (1982). McGuffey used 15 categories of variables to report the research he included in his analysis. These categories can be found in Table 1 below.

Table 1

Categories of Variables

Physical environment	School building configuration	Programmatic/Physical
School building age	Amount of space	Site size
Thermal factors	Open space	Building utilization
Visual factors	Windowless facilities	Building maintenance
Color and interior painting	Underground facilities	Support facilities
Hearing		Special instruction areas
		Size of school

The categories included in the CAPE are structural, cosmetic, and technological. Specific questions are listed under each category. Twelve items are categorized as structural, fourteen as cosmetic, and four in the area of technology. These categories are shown in Table 2 below.

Table 2

CAPE Items and their Applicable Building Condition Categories

Structural items	Cosmetic items	Technology items
Building age	Interior wall paint	School-wide network
Windows	Interior paint cycle	District-wide network
Flooring	Exterior wall paint	Internet access
Heating	Exterior paint cycle	Cable television
Air conditioning	Adjacent facilities	
Roof leaks	Floors swept	
Locker condition	Floors mopped	
Ceiling covering	Graffiti	
Science lab equipment	Graffiti removal	
Science lab age	Classroom furniture	
Lighting	School grounds	
Building condition	Wall color	
	Exterior noise	
	Building condition	

The structural items are designed to rate the building based on the condition of the actual building. The cosmetic items are designed to determine how the building will be rated based on how appealing and inviting it is both inside and outside. The technology items are used to find out the level of technology that is accessible to staff and students

The CAPE, a 33-item instrument, is self-administered by the individual building principals where he or she is asked to respond to several objective questions concerning the condition of his or her building. Each survey is scored and those scores are used to rate each building to determine if a building was substandard or standard. The CAPE has great internal consistency. A reliability analysis by SPSS showed Cronbach's Alpha to be 823.

The scoring of the CAPE is based upon a numerical value for each item. All items, except six, have three possible responses. The first response for each item with three responses, identified as response A, receives a value of one; the second response, identified as response B, receives a value of two; and the last response, identified as response C, receives a value of three. The exception to this tripartite response system is the scoring for Items 12, 15, 25, 26, 27, and 28. For Item 12 (i.e. an item that addresses the issue of facilities located adjacent to or inside the school building), item 15 (i.e. an item that addresses the issue of graffiti), and the technology questions addressed in Items 26 through 29, the possible responses are no and yes. For Item 12, a "no" response is given a value of zero and a "yes" response receives a value of one. For item 15, a "no" response is assigned a value of two and a "yes" response is given a value of one. For

Items 26 – 29, a “no” response is designated a one and a “yes” response is assigned a value of two. Items 1, 31, 32 and 33 are not included in this scoring process.

The score for a building is derived by adding the values of all the responses to the survey questions. If a school building received the lowest score on all questions, the total score for the building would be 35. The assessment score for a building that received the highest score on every question would be 103. Appendix A summarizes how the CAPE score for each building is derived based on the responses of the principal to the items on the CAPE.

As stated earlier, the CAPE score each building received was used to categorize it as either substandard or standard. These categories were determined by using the quartile method. In this method the researcher divided the total number of buildings into quartiles based on their scores. The buildings in the bottom quartile were rated as substandard and those in the top quartile were rated as standard. The buildings in the two middle quartiles were not used in the study. Cash (1993) in her study of small high school in the Commonwealth of Virginia divided the schools into three categories: substandard, standard, and above standard. She classified the schools in the bottom quartile as substandard, the schools in the middle two quartiles as standard, and the schools in the top quartile as above standard. She found that there was very little variance between the test scores of the students in the standard schools and those in either the substandard or above standard schools. She recommended using the top quartile of schools as the standard category and the bottom quartile of schools as the substandard category of schools.

The overall CAPE score for the buildings could range from a low of 35 to a high

of 103. The actual overall CAPE scores based on the responses received ranged from 49 to 78. The structural score for the buildings could range from a low of 12 to a high of 36. The actual structural score ranged from 18 to 35. The cosmetic score could range from a low 20 to a high of 62. The actual cosmetic score ranged from 37 to 60. Finally the technology score could range from a low of four (4) to a high of eight (8). The actual technology score ranged between six (6) and eight (8).

Data Gathering

Three types of data were collected: student achievement performances, socio-economic status, and school facilities condition.

Student Achievement Performance

The Virginia SOL examination is administered to all eighth grade students in Virginia each school year. The September 30, 2005 Virginia Department of Education (VDOE) Fall Membership report showed a total of 95,716 eighth grade students enrolled in Virginia public schools as of that date and all eighth grade students were tested in the four core areas of English, mathematics, science, and social studies. The percentage of eighth grade students passing the SOL Examinations in English, mathematics, and science, which was obtained from VDOE, in the schools where principals completed the CAPE was used in this study.

Socio-Economic Status

Data for the socio-economic status of the school was obtained from the VDOE website. The September 30, 2005, Virginia Department of Education (VDOE) Fall Membership report showed a total of 284,142 students enrolled in the participating schools as of that date. The percentage of students who participated in the free and

reduced lunch program at each school which participated in this program at each was used for this study.

School Facilities Condition

This study focused on the 304 middle schools that served students in grades five through eight and several elementary and high schools that served eighth grade students in the Commonwealth of Virginia. In order to collect data from these schools, the permission of the division superintendents had to be obtained. This was done by sending all superintendents an email explaining the purpose of the study and asking their permission to survey the school principals in their respective divisions.

Once permission was granted by the division superintendents to conduct the surveys, the principals of each school in the participating divisions were sent an email in which the research study was introduced and the purpose of the survey explained. The principals were informed that their superintendent was aware of the survey and had granted permission for them to participate. The assessment instrument (CAPE) was sent as a web-link asking principals to complete and return it as soon as possible. For those principals who did not respond, a letter was sent with a copy of the survey attached encouraging them to complete and return it in the self-addressed stamped envelope.

Data Analysis

To analyze the data, the results of the CAPE, the SOL percentage scores, and the percentage of students participating in the free and reduced lunch program at each school was used.

All of the data were loaded in the *Statistical Package for Social Science (SPSS)*. For the CAPE data, each school was loaded using an identification number unique to

each school and a response category was established for each item. After the data were analyzed to determine the final score for each school, the schools were ranked from highest to lowest using the CAPE score and the schools were then divided in quartiles. The top 25 percent of the schools were classified as standard and the bottom 25 percent were classified as substandard. The two middle groups of schools were not used in the study because previous studies (Cash, 1993) found that there was very little variance in the test scores of students in the middle two categories and those in the upper and lower categories.

The scores for eighth grade students in English, mathematics, and science were used. The percentage of students receiving passing scores on the SOL Examinations for each subject in each school was used to calculate a student performance score for the schools in the substandard and the standard categories. The scores for the top quartile were compared to the scores for bottom quartile through the use of ANCOVA.

The scores for the 12 structural items on the CAPE were used to identify a different category of schools for top and bottom quartiles. The percentage of students receiving passing scores on the SOL Examinations for each subject from the SOL examinations in each of these schools was used to calculate a student performance score for the substandard and the standard categories. The scores of the schools in the substandard category were compared to the scores of the schools in the standard category through the use of a ANCOVA.

The scores for the 14 cosmetic items on the CAPE were used to identify yet another category of schools for the substandard and standard categories. The percentage of students receiving passing scores on the SOL Examinations for each subject in each of

these schools were used to calculate a student performance score for the substandard and the standard categories. The scores of the schools in the substandard category were compared to the scores of the schools in the standard category through the use of ANCOVA.

The socioeconomic status of the school was used as a covariant to adjust for the achievement means. The percentage of students participating in the free and reduced lunch program was used to determine the socioeconomic status of the school. Upon completion of the data analysis, the results were compared to the results of similar studies done in the Commonwealth of Virginia on high schools to determine if there were consistencies in the findings.

CHAPTER 4: FINDINGS

Introduction

Analysis began after receiving the data from the principals who completed the CAPE assessment instrument. The first task was to consolidate the data. Then the calculation of the building condition score for each building based on the principal's responses on the CAPE instrument was completed. Next, the buildings were arranged in ascending order based on the building condition scores. The next task was the division of the schools into quartiles, again based on the building condition score for each school. The schools in the bottom quartile were classified as substandard and those in the top quartile classified as standard. Finally, the percentage of students passing the SOL Examinations for school buildings classified as substandard were compared to the percentage of students passing the SOL Examinations for school buildings classified as standard.

Survey Procedures

In the Commonwealth of Virginia there are 134 school divisions and 304 schools classified as middle schools. An e-mail was sent to the superintendent of each of the 134 school divisions explaining the research and requesting permission to contact the middle schools in their divisions about completing the CAPE assessment instrument. The e-mail to the superintendents was sent out in October 2006. Of the requests sent out to superintendents, 76 representatives from school divisions granted permission for the CAPE assessment instrument to be sent to their principals. Initially only schools classified as a middle school by Department of Education were considered. There are some school divisions, however, that have K-8 elementary schools and 8-12 high schools.

The CAPE assessment instrument was sent to all schools that taught eighth grade during the 2005-2006 school year whose division had granted permission. There were 191 schools that taught eighth grade during the 2005-2006 school year in the divisions that granted permission. Of the 191 schools eligible to participate, 111, or 58 percent, responded.

The collection of data began in October 2006. The CAPE was placed on an e-mail web link using the Survey Monkey data collection system. An e-mail containing the web link was sent to each participating principal with an explanation of the research project and instructions on how to gain access to the CAPE via the web link. Principals were instructed to complete the CAPE on line, click "submit" when completed, and the results would be automatically tallied and stored in the website database. The names of the school division, school, and principal were stored on the database. This would prevent sending out a second request to schools that already had responded. A second request was sent via U.S. mail to the principals that did not respond to the original request. Once the surveys were received, the information was entered into SPSS for analysis of the data.

The schools in the highest and lowest quartiles were then identified as the population of the study. As shown in Appendix B, twenty-nine school buildings (26% of the total) in the lower quartile were classified as substandard with scores ranging from 49-61. Twenty-seven school buildings (24% of the total) in the upper quartile were classified as standard and had CAPE scores ranging from 72-78.

The responses from the principals of the 111 schools to items 2-6, 11, 17-21 and 30 on the CAPE assessment instrument were used to identify the schools in the highest and lowest quartiles based on the structural areas of the buildings. As shown in Appendix

C, the scores of the 29 schools in the lowest quartile ranged from 18 to 25 and these schools were classified as substandard. The highest quartile included 31 schools with scores between 31 and 35; these schools were classified as standard. Then the standard and substandard schools were used in the comparison of percentage of students passing the SOL Examination to evaluate the relationship between the structural building condition and student achievement.

The responses from the principals of the 111 schools to items 7-10, 12-16, 22-25 and 30 on the CAPE assessment instrument were used to identify the schools in the highest and lowest quartiles based on the cosmetic areas of the buildings. As shown in appendix D, the scores of the 28 schools lowest quartile of schools ranged from 37 to 45; these schools were classified as substandard. The highest quartile included 27 schools with scores between 53 and 60; these schools were classified as standard. Once the standard and substandard schools were determined, they were used in the comparison of percentage of students passing the SOL Examination to evaluate the relationship between the cosmetic building condition and student achievement.

The final category addressed by the CAPE was technology. Items 26 – 29 addressed the technology issue in the school buildings. As stated earlier, the goal in analyzing these items was to determine the effect of the availability of technology on student achievement. As with the items in the structural and cosmetics categories, a range of scores for the technology area was obtained by evaluating the responses to items 26 – 29 on the CAPE assessment instrument by the principals of the 111 participating schools. Again, the results from this analysis of the items produced a listing of schools from which the top and bottom quartile were used for comparison purposes of percent of students

passing the SOL Examination. The school buildings were much too similar in the area of technology to establish groups of schools with much difference between them.

Item 31 asked for the approximate square footage of their school and item 32 asked for the approximate acreage of the school grounds. Item 33 could be used by the principals to make comments. The overall, structural, and cosmetic ranges are displayed in Table 3.

Table 3

Overall, Structural, and Cosmetic Scores Based on the CAPE Assessment Responses

Building Category	Range	N	Percentage
Overall Standard	72-78	27	24
Overall Substandard	49-61	29	26
Structural Standard	31-35	31	27
Structural Substandard	18-25	27	26
Cosmetic Standard	53-60	26	23
Cosmetic Substandard	37-45	28	25

Achievement and Overall Building Condition

Once the CAPE scores for the buildings were computed and the standard and substandard buildings were determined, the SOL data were used to compare student achievement in the two categories of buildings. The percentage of students who qualified for free and reduced lunch was the covariant used to adjust for socioeconomic status. The percentage of students passing the English SOL was 3.89 percent higher for the buildings classified as standard than the buildings classified as substandard. The percentage of students passing the mathematics SOL was 2.22 percent higher for the buildings classified as standard than the buildings classified as substandard. The percentage of

students passing the science SOL was 3.86 percent higher for the buildings classified as standard than the buildings classified as substandard. These results support the results from previous studies that indicated that students perform better in newer buildings than they do in older buildings.

When comparing the scores of males and females in standard category to males and females in the substandard category, the differences in passing percentage were greater for females than males in all three subject areas. The largest differences in passing percentages between the standard and substandard buildings were for females in English and science. The difference in English was 4.59 percentage points. In science the difference was 4.24 percentage points. The difference passing percentage for females in mathematics between the standard and substandard buildings was 2.82 percentage points.

When comparing the passing percentages of males to female in standard buildings, females did better than males in English and mathematics, while males did slightly better than females in science. In the substandard buildings, the passing percentage for males was greater in English and science but better for females in mathematics. The male and female overall scores were compared to determine if building condition had more of an effect on one group than the other. Table 4 below illustrates the differences.

Table 4

A Comparison of Student Passing Percentages on the Standards of Learning Tests in the Overall Building Condition Category

Course	Standard	Substandard	Difference	Significance
English	80.96	77.07	3.89	.807
English-Fem	85.08	70.48	4.59	.386
English Male	76.75	75.31	1.43	.849
Mathematics	76.59	74.37	2.22	.497
Math-Fem	79.79	76.97	2.82	.976
Math-Male	74.12	73.65	0.47	.284
Science	89.48	85.62	3.86	.360
Science-Fem	89.48	85.24	4.24	.284
Science-Male	89.64	86.79	2.85	.675

Achievement and Structural Building Condition

The structural building condition classification addressed the areas of building age, windows, hearting, air conditioning, flooring, roof leaks, lockers, classroom ceiling material, and lighting. There were 12 items on the CAPE that addressed these areas and the effect they may have had on student achievement. The schools were divided into quartiles based on the responses of the principals to the structural questions. The schools in the lower quartile scored between 18 and 25. The school in the higher quartile scored between 31 and 35.

Based on the analysis of the data for the structural items, the passing percentage for students on the English SOL was 5.29 percent higher in the standard schools when compared to the substandard schools. The passing percentage for students on the

mathematics SOL was 5.86 percent higher in the standard schools when compared to the substandard schools. The passing percentage for students on the science SOL was 5.16 percent higher in the standard schools when compared to the substandard schools. The largest differences in passing percentages between the standard and substandard buildings were for females in math and science. The difference in math was 7.35 percentage points. In science the difference was 6.22 percentage points. In science the difference in passing percentage of 6.22 was found to be significant at the <.05 level. There was no significant difference in student passing percentages on the Math score. Table 5 below illustrates these differences.

Table 5

A Comparison of Student Passing Percentages on the Standards of Learning Tests in the Structural Building Condition Category

Course	Standard	Substandard	Difference	Significance
English	81.43	76.14	5.29	.819
English-Fem	84.93	80.21	4.72	.120
English Male	77.68	71.93	5.75	.387
Mathematics	78.50	72.64	5.86	.378
Math-Fem	81.50	74.14	7.35	.203
Math-Male	75.75	71.00	4.75	.623
Science	89.87	84.71	5.16	.077
Science-Fem	90.00	83.78	6.22	.046*
Science-Male	89.87	87.35	2.51	.339

*p<.05

Achievement and Cosmetic Building Condition

The cosmetic building condition classification addressed many areas including the paint on the interior and exterior walls, the painting schedule for those walls, facilities located adjacent to the school building, the sweeping and mopping of the floors, graffiti inside and outside the building, classroom furniture, the condition of the school grounds, the color of the walls in the instructional areas, and the location of the school building in reference to major highways, rail ways and airports. There were 14 items on the CAPE that addressed these areas and the effect they may have had on student achievement. The schools were divided into quartiles based on the responses of the principals to the cosmetic questions. The schools in the lower quartile scored between 37 and 45. The schools in the higher quartile scored between 53 and 60.

Based on the analysis of the data for the cosmetic items, the passing percentage for students on the English SOL was 4.77 percent higher in the standard schools when compared to the substandard schools. The passing percentage for students on the mathematics SOL was 6.47 percent higher in the standard schools when compared to the substandard schools. The passing percentage for students on the science SOL was 5.13 percent higher in the standard schools when compared to the substandard schools. The largest differences in passing percentages between the standard and substandard buildings were for females in math at 8.04 percent. The next largest difference in passing percentage was for males in English at 6.28 percent. Table 6 below illustrates these differences.

Table 6

A Comparison of Student Passing Percentages on the Standards of Learning Tests in the Cosmetic Building Condition Category

Course	Standard	Substandard	Difference	Significance
English	81.05	76.28	4.77	.826
English-Fem	85.05	81.14	3.90	.916
English Male	77.00	70.71	6.28	.886
Mathematics	78.89	72.42	6.47	.704
Math-Fem	81.26	73.21	8.04	.317
Math-Male	76.57	71.35	5.22	.855
Science	90.05	84.92	5.13	.449
Science-Fem	89.80	85.42	4.37	.684
Science-Male	90.35	84.71	5.64	.469

Achievement and Individual Building Condition Factors

As shown from the previous tables, the two areas, structural and cosmetic, had varying relationships with student achievement. To get a better idea of how each component was related to student achievement, the components were analyzed individually. The schools that had been previously identified as substandard or standard for overall building condition were used in this analysis. The schools were sorted based on the score of the component being analyzed to determine substandard and standard schools. As stated earlier, all items used in the analysis had either two or three responses. Items 2-11, 13-14, 16-25 and 30 have three possible responses. The first response was weighted as one, the second response was weighted as two, and the third response was

weighted as a three. Items 12, 15, and 26-29 had two possible responses. Items 1 and 31-33 were not included in the overall rating of the buildings.

Building Age

The age of the buildings in the study were well represented in all three categories. If the response by the principal for this particular item was weighted as one, the building was categorized as substandard. Buildings whose principals' response to this item was a three made up the standard category. When the two categories of buildings were compared, the percentages of students passing the English SOL subtest was 6.10 percent higher for buildings in the standard category than building in the substandard category. The percentage of students passing the mathematics SOL was 3.28 percent higher in the standard building when compared to the substandard buildings. The percentage of students passing the science SOL was 4.18 percent higher in the standard building when compared to the substandard buildings. Table 7 below illustrates these differences.

Table 7

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the age of the building

Subject	Buildings 19 years old or less	Buildings 40-60 years old or less	Difference	Significance
English	82.25	76.15	6.10	.349
Mathematics	77.40	74.11	3.28	.758
Science	89.70	85.51	4.18	.610

Windows

Eighty percent of the school buildings had windows in at least three-fourth of their instructional area. In comparing the percentages of students in the standard and

substandard categories passing the SOL test, the passing percentage in English was 3.48 percent higher in the building in the standard category than in the buildings in the substandard category. The percentage of students passing the mathematics SOL test was 4.18 percent higher in buildings in the substandard category than in buildings in the standard category. The percentage of students passing the science SOL test was 0.87 percent higher in buildings in the standard category than in buildings in the substandard category. Table 8 below illustrates these differences.

Table 8

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the windows in the building

Subject	Windows in at least ¾ on instructional area	Windows in less than ¼ of the instructional area	Difference	Significance
English	79.28	75.80	3.48	.301
Mathematics	75.42	79.60	-4.18	.464
Science	88.60	87.73	0.87	.713

Floors

Ninety-five percent of the school buildings indicated that they had tile or terrazzo floors in the majority of their instructional area. This group of schools made up the substandard category. Only five percent of the schools indicated that they had carpet, which is considered the ideal flooring in this survey, in the majority of their instructional area. These schools made up the standard category.

In comparing the percentages of students in the standard and substandard categories passing the SOL test, the passing percentage in English was 7.62 percent higher in the building in the substandard category than in the buildings in the standard

category. The percentage of students passing the mathematics SOL test was 24.69 percent higher in building in the substandard category than in buildings in the standard category. This difference was found to be significant at the <.05 level. The percentage of students passing the science SOL test was 5.01 percent higher in building in the standard category than in buildings in the substandard category. The small number of schools in the standard category possibly skewed the results in the area. Table 9 below illustrates these differences.

Table 9

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the floor coverings

Subject	Carpet	Tile or Terrrazzo	Difference	Significance
English	71.67	79.29	-7.62	.360
Mathematics	52.67	77.36	-24.69	.003*
Science	87.68	82.67	5.01	.501

*p<.05

Heat

There were a number of buildings in each of the three heat categories. The school rated a one, 24 total, made up the substandard category and the 18 schools rated as a three made up the standard category. The percentage of students passing the English SOL test was 2.15 percent higher in standard category than those in the substandard category. In mathematics 1.46 percent more students pass the SOL test in standard category than in the substandard category. The percentage of students passing the science SOL test was 2.93 percent higher in standard category than those in the substandard category. Table 10 below illustrates these differences.

Table 10

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the heating system in the building

Subject	Even heat able to control	Uneven heat unable to control	Difference	Significance
English	80.20	78.04	2.15	.804
Mathematics	76.94	75.47	1.46	.686
Science	89.15	86.22	2.93	.543

Air Conditioning

The principals of only four schools indicated that they had no air conditioning in the instructional areas. These schools made up the substandard category. Twenty eight principals indicated that their schools had air conditioning in all instructional areas. These schools made up the standard category. In English 8.25 percent more students pass the SOL test in standard category than in the substandard category. The percentage of students passing the mathematics SOL test was 0.82 percent higher in standard category than those in the substandard category. In science 7.81 percent more students pass the SOL test in standard category than in the substandard category. These differences are illustrated in the table 11 below.

Table 11

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the air conditioning system in the building

Subject	Air conditioning in all instructional areas and can be well regulated	No air conditioning available	Difference	Significance
English	80.25	72.00	8.25	.435
Mathematics	77.07	76.25	0.82	.720
Science	88.81	81.00	7.81	.150

Interior Paint

This question asked the last time the interior walls, including classroom spaces, was painted and assesses whether this may have an effect on student achievement. The choices were over 15 years ago, between 8 and 15 years ago, and less than eight years ago. Again principals whose response was one formed the substandard category of school buildings while principals whose response was three formed the standard category. The percentage of students passing the English SOL was 3.38 percent higher in the substandard building when compared to the standard buildings. In mathematics 6.47 percent more students pass the SOL test in substandard category than in the standard category. The percentage of students passing the science SOL was 0.48 percent higher in the standard building when compared to the substandard buildings. Table 12 below illustrates these differences.

Table 12

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the interior paint in the instructional area

Subject	Painted less than eight years ago	Painted over 15 years ago	Difference	Significance
English	79.61	83.00	-3.38	.790
Mathematics	75.83	82.33	-6.47	.575
Science	88.14	87.66	0.48	.452

Interior Paint Schedule

This question asked if the painting of the interior walls in the instructional area was done on a regularly scheduled basis. There were 31 respondents who reported that they had a regular paint cycle for interior walls that was eight years or less. Principals who responded as a one were classified as substandard and principals who responded with a three were classified as standard. The passing percentage for the English SOL was 4.23 percent higher in buildings classified as standard than those classified as substandard. The passing percentage for the mathematics SOL was 7.25 percent higher in buildings classified as standard than those classified as substandard. Finally in the schools classified as standard, 3.37 percent of the students passing were higher than schools classified as substandard in science. Table 13 below illustrates the difference.

Table 13

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the interior painting schedule in the instructional area

Subject	Yes, eight years or less cycle	No	Difference	Significance
English	80.55	76.32	4.23	.754
Mathematics	78.75	71.50	7.25	.295
Science	88.96	85.59	3.37	.703

Exterior Paint

This question asked the last time the exterior walls or windows and trim was painted and assesses whether this may have an effect on student achievement. The choices were over 7 years ago, between 4 and 7 years ago, and within the last four years or no exterior surface requires painting. Again the principals whose response was a one formed the substandard category of school buildings while the principals who responded with a three formed the standard category. The percentage of students passing the English SOL was 2.54 percent higher in the standard building when compared to the substandard buildings. In mathematics 0.63 percent more students pass the SOL test in standard category than in the substandard category. The percentage of students passing the science SOL was 2.20 percent higher in the standard building when compared to the substandard buildings. Table 14 below illustrates these differences.

Table 14

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the exterior paint

Subject	Painted less than four years ago	Painted over seven years ago	Difference	Significance
English	79.04	76.50	2.54	.826
Mathematics	75.68	75.05	0.63	.526
Science	87.95	85.75	2.20	.714

Exterior Paint Schedule

This question asked if the painting of the exterior walls was done on a regularly scheduled basis. There were 26 respondents who reported that they had a regular paint cycle for exterior walls that was seven years or less or that no exterior surfaces required periodic painting. Principals whose response was a one were classified as substandard and the principals who responded with a three were classified as standard. The passing percentage for the English SOL was 2.73 percent higher in buildings classified as standard than those classified as substandard. The passing percentage for the mathematics SOL was 5.53 percent higher in buildings classified as standard than those classified as substandard. Finally in the schools classified as standard 3.45 percent of the students scored higher than schools classified as substandard. Table 15 below illustrates the difference.

Table 15

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the exterior painting schedule

Subject	Yes, seven years or less or not needed	No	Difference	Significance
English	80.92	78.19	2.73	.536
Mathematics	79.45	73.92	5.53	.571
Science	89.76	86.30	3.45	.656

Roofs

This question used the condition of the interior ceiling as an indicator of leakage or water damage to the roof. The three choices of responses were: (1) ceiling is deteriorating due to water damage and/or water falls in some areas of the facility requiring buckets for water collection, (2) ceiling is currently developing a few stains due to minor leaks, (3) or no visible signs or only a few old water spots in the ceiling. As stated earlier the principals whose response was a one was categorized as substandard. The principals who responded with a three made up the standard category. When the percentage of students passing the English SOL test in the substandard category were compared to the percentages of students passing the English SOL test in the standard category, the percentage of students passing was 2.40 percent higher for buildings in the standard than building in the substandard category. The percentage of students passing the mathematics SOL was 0.21 percent higher in the standard building when compared to the substandard buildings. The percentage of students passing the science SOL was 2.16 percent higher in the standard building when compared to the substandard buildings. Table 16 below illustrates these differences.

Table 16

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the roof

Subject	Ceiling has no visible stains or only a few old water spots in the ceiling	Ceiling is deteriorating due to water damage and/or water falls in some areas requiring buckets for collection	Difference	Significance
English	77.35	79.76	2.40	.336
Mathematics	76.50	76.71	0.21	.915
Science	85.92	88.09	2.16	.352

Adjacent Facilities

The principals were also asked about facilities located adjacent to or inside their buildings that were being used by or somehow associated with their school. Those facilities included football stadiums, football fields, soccer fields, tennis courts, swimming pools, softball fields, wrestling rooms, and weight rooms. The respondent received one point for each facility located adjacent to or inside their school. If the school did not have any facilities located adjacent to or inside it the respondent received a zero. The scores were computed and sorted in ascending order from one to ten. Schools with a score of two or less were classified as substandard. Schools with a score of five or more were classified as standard. The percentage of students passing the English SOL test in the standard category was 0.85 percent higher those in the substandard category. In mathematics, the percentage of students passing the SOL test was 7.57 percent higher in the substandard than in the standard category. This difference was found to be significant

at the <.05 level. The percentage of students passing the science SOL test in the standard category was 0.82 percent higher those in the substandard category. Table 17 below illustrates these differences.

Table 17

A Comparison of Student Passing Percentages on the Standards of Learning Tests and facilities that are either a part of or located adjacent to the school building

Subject	Five or more adjacent facilities	Two or fewer adjacent facilities	Difference	Significance
English	79.75	78.90	0.85	.497
Mathematics	72.90	80.48	-7.57	.028*
Science	88.33	87.51	0.82	.349

*p<.05

Floors Swept

This item looked at how often classroom floors were swept (if wood, tile, or terrazzo or vacuumed if carpeted) to determine its effect on student achievement. Principals in 52 of the 56 schools indicated that the floors were swept daily or more frequent. Those are the schools that were classified as standard. Four principals indicated that the floors were swept at least weekly. This group made up the substandard category. There were no schools that indicated that the floors were swept monthly. The passing percentage of students for the English SOL was 2.26 percent higher in buildings classified as standard than those classified as substandard. The passing percentage for the mathematics SOL was 2.51 percent higher in buildings classified as standard than those classified as substandard. Finally in the schools classified as standard the difference in percent of students passing was1.69 percent higher than schools classified as substandard.

The number of schools in each category may cause the validity of these results to be questionable. Table 18 below illustrates the difference.

Table 18

A Comparison of Student Passing Percentages on the Standards of Learning Tests and how often the floors are swept

Subject	Daily or more frequently	Weekly	Difference	Significance
English	81.00	78.74	2.26	.540
Mathematics	78.33	75.82	2.51	.775
Science	89.00	87.31	1.69	.481

Floors Mopped

This item looked at how often classroom floors were mopped to determine its effect on student achievement. The schools that were mopped daily or weekly, N = 32, classified as standard. The schools that were mopped annually, N = 9, were classified as substandard. The passing percentage for the English SOL was 1.05 percent higher in buildings classified as substandard than those classified as standard. The passing percentage for the mathematics SOL was 6.49 percent higher in buildings classified as standard than those classified as substandard. Finally the percentage of students passing science in the schools classified as substandard was 0.08 percent higher than schools classified as standard. The number of schools in each category may cause the validity of these results to be questionable. Table 19 below illustrates the difference.

Table 19

A Comparison of Student Passing Percentages on the Standards of Learning Tests and how often the floors are mopped

Subject	Daily or weekly	Annually	Difference	Significance
English	78.50	79.55	-1.05	.112
Mathematics	75.93	69.44	6.49	.481
Science	86.81	86.89	-0.08	.176

Graffiti

The principals were asked if they had a problem with graffiti in any areas of their facility. The areas in question were bathrooms, lockers, hallways, classroom wall or doors, other interior areas, exterior walls, exterior walkways or any other exterior surfaces. The two possible responses were yes and no. If the response of the principal was yes they received a one. If the response was no they received a two. The scores were computed and sorted in ascending order. The possible range of scores was 8-16. The standard category was made up of schools with a perfect score of 16. Schools with a score of 15 or less made up the substandard category. The percentage of students passing the English SOL test in the standard category schools was 3.10 percent higher than those in the substandard category. In mathematics, the percentage of students passing the SOL test was 0.24 percent higher in the standard than in the substandard category. The percentage of students passing the science SOL test in the standard category was 3.13 percent higher those in the substandard category. Table 20 below illustrates these differences.

Table 20

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the presence of graffiti inside or outside the building

Subject	None present	Present in some or all areas	Difference	Significance
English	80.19	77.09	3.10	.675
Mathematics	76.06	75.82	0.24	.508
Science	88.74	85.60	3.13	.316

Graffiti Removed

This item looked at how long it took graffiti to be removed. There were five respondents who stated that it took more than a week but less than a month for graffiti to be removed. This group of schools made up the substandard category. The remaining schools made up the standard category. There were no schools who stated they waited until summer maintenance for graffiti to be removed. The percentage of students passing the English SOL test was 4.27 percent higher in standard category than those in the substandard category. In mathematics 2.38 percent more students pass the SOL test in standard category than in the substandard category. The percentage of students passing the science SOL test was 5.07 percent higher in standard category than those in the substandard category. Table 21 below illustrates these differences.

Table 21

A Comparison of Student Passing Percentages on the Standards of Learning Tests and how quickly graffiti was removed

Subject	Less than a week or none present	More than a week but less than a month	Difference	Significance
English	79.27	75.00	4.27	.428
Mathematics	76.18	73.80	2.38	.794
Science	87.87	82.80	5.07	.630

Lockers

Thirty-eight of the principals indicated that over three-fourths of the lockers in their buildings were functional and in good repair. The standard category was comprised of these schools. Sixteen schools indicated that at least three-fourth of their lockers were functional and in good repair while only one principal indicated that most of the lockers in the building were not functional and not in good repair. The substandard category was made up of those 17 schools who indicated that at least three-fourth of their lockers were functional and in good repair or that most of the lockers in the building were not functional and not in good repair. When the percentage of students passing the English SOL test in the standard category were compared to the percentages of students passing the English SOL test in the substandard category, the difference in percentage of students passing was 3.80 percent higher for buildings in the standard category than building in the substandard category. The percentage of students passing the mathematics SOL was 8.60 percent higher in the standard building when compared to the substandard buildings. The percentage of students passing the science SOL was 3.52 percent higher in the

standard building when compared to the substandard buildings. Table 22 below illustrates the differences in the percentages.

Table 22

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the lockers

Subject	Over ¾ of the lockers are functional and in good repair	Most lockers are not functional or not in good repair	Difference	Significance
English	80.14	76.34	3.80	.974
Mathematics	78.88	70.28	8.60	.160
Science	88.58	85.06	3.52	.655

Ceiling Material

This item addressed the materials used in the interior ceilings. The choices were: (1) wood or open beams, (2) plaster or acoustical tiles in at least three-fourths of the instructional spaces, or (3) acoustical tiles throughout the instructional spaces. The principals in schools who indicated three as their response are included in the standard category while principals whose response was one were included in the substandard category. The passing percentage for the English SOL was 4.26 percent higher in buildings classified as standard than those classified as substandard. The passing percentage for the mathematics SOL was 1.89 percent higher in buildings classified as standard than those classified as substandard. Finally in the schools classified as standard, the percentage of students passing were 3.06 higher in science than for students in schools classified as substandard. The number of schools in each category may cause the validity of these results to be questionable. Table 23 below illustrates the difference.

Table 23

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the ceiling material

Subject	Acoustical tiles throughout the instructional area	Wooden or open beam	Difference	Significance
English	79.97	75.71	4.26	.615
Mathematics	76.46	74.57	1.89	.705
Science	88.20	85.14	3.06	.715

Science lab Equipment

This item asked the principal to indicate the utilities available and in usable condition in their science labs. The choices were: sinks and water; sinks, water and electricity; or sinks, water, electricity, and gas. The substandard category consisted of the seven schools whose principal said their labs only had sinks and water. The standard category consisted of the 25 schools whose principal indicated that their labs had sinks, water, electricity, and gas. The percentage of students passing the English SOL test was 2.33 percent higher in standard category than those in the substandard category. In mathematics 6.65 percent more students passed the SOL test in standard category than in the substandard category. The percentage of students passing the science SOL test was 3.50 percent higher in standard category than those in the substandard category. Table 24 below illustrates these differences.

Table 24

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the utilities available in the science lab

Subject	Sinks, water, gas and electricity	Sinks and water	Difference	Significance
English	78.76	76.43	2.33	.126
Mathematics	75.79	69.14	6.65	.832
Science	88.36	84.86	3.50	.300

Age of Science lab Equipment

This item asked the principals to indicate approximately how long it had been since the utilities in their science labs had been updated to current standards. Principals in 22 schools indicated that it had been over ten years since the utilities had been updated. These schools made up the substandard category. Principals in 21schools indicated that it had been less than five years since the utilities had been updated or their building is less than five years old. The standard category consisted of those 21 schools. The percentage of students passing the English SOL test was 5.71 percent higher in standard category than those in the substandard category. In mathematics 4.52 percent more students pass the SOL test in standard category than in the substandard category. The percentage of students passing the science SOL test was 4.93 percent higher in standard category than those in the substandard category. Table 25 below illustrates these differences.

Table 25

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the age of the utilities in the science lab

Subject	Less than five years or building is less than five years old	Over ten years old	Difference	Significance
English	81.66	75.95	5.71	.512
Mathematics	77.57	73.05	4.52	.910
Science	89.61	84.68	4.93	.359

Lights

This item asked the type of lights used in the instructional areas. Responses could be: (1) incandescent; (2) fluorescent-hot; (3) fluorescent-cold. One school indicated the use of incandescent lights and 11 schools indicated the use of hot fluorescent lighting in their instructional areas. These schools made up the substandard category. The percentage of students passing the English SOL test was 2.40 percent higher in standard category than those in the substandard category. In mathematics 3.50 percent more students passed the SOL test in standard category than in the substandard category. The percentage of students passing the science SOL test was 4.05 percent higher in standard category than those in the substandard category. Table 26 below illustrates these differences.

Table 26

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the type of lights in the instructional area

Subject	Fluorescent cold	Fluorescent hot	Difference	Significance
English	79.40	77.00	2.40	.957
Mathematics	76.75	73.25	3.50	.776
Science	88.30	84.25	4.05	.144

Furniture

This item asked the condition of the furniture used in the classrooms. The substandard category of buildings consists of the schools whose principal responded with number one, N = 2, which indicates that the furniture is either facially scarred or functionally damaged. The standard category of buildings consists of the schools whose principal responded with a number three, N = 27, which indicated that all classrooms have furniture which is functionally sound and facially attractive. The percentage of students passing the English SOL test was 6.76 percent higher in substandard category than those in the standard category. In mathematics 5.27 percent more students pass the SOL test in substandard category than in the standard category. The percentage of students passing the science SOL test was 5.38 percent higher in substandard category than those in the standard category. The difference in the number of school buildings in each group was large and this may account for the large negative differences in percent of students passing. Table 27 below illustrates these differences.

Table 27

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition of the furniture in the instructional area

Subject	All furniture is functionally sound and facially attractive	Most rooms have furniture that is either facially scarred or functionally damaged	Difference	Significance
English	79.74	86.50	-6.76	.378
Mathematics	76.73	82.00	-5.27	.614
Science	88.62	94.00	-5.38	.274

School Grounds

This item addressed the landscaping, sidewalks, and the overall attractiveness of the school grounds. Principals in 29 buildings indicated that the landscaping and other facilities are attractive and well-maintained at their location. These schools comprised the standard category. When the percentage of students passing the English SOL test in the standard category were compared to the percentages of students passing the English SOL test in the substandard category, the percentage of students passing was 4.54 percent higher for buildings in the standard category than building in the substandard category. The percentage of students passing the mathematics SOL was 0.69 percent higher in the standard building when compared to the substandard buildings. The percentage of students passing the science SOL was 5.50 percent higher in the standard building when compared to the substandard buildings. Table 28 below illustrates these differences.

Table 28

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the condition and appearance of the school grounds

Subject	The landscaping and other facilities are attractive and well maintained	There is no landscaping and sidewalks are either not present or damaged	Difference	Significance
English	79.54	75.00	4.54	.975
Mathematics	77.69	77.00	0.69	.552
Science	88.50	83.00	5.50	.609

Wall Color

In looking at the responses to this item, it shows that only one school indicated that they have dark colored walls in their instructional area and only six indicated that they have pastel colors. Those seven schools made up the substandard category. Forty-eight schools have white or off white walls in the majority of their instructional area. These 48 schools make up the standard category. When analyzing the data, it showed that students in schools in the standard category scored 3.29 percent higher in English than students in schools in the substandard category. In mathematics, students in schools in the substandard category scored 3.17 percent higher than students in schools in the standard category. In science, students in schools in the standard category scored 2.11 percent higher than students in schools in the substandard category. Table 29 below illustrates these differences.

Table 29

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the color of the walls in the instructional area

Subject	White or off white	Pastel or dark color	Difference	Significance
English	79.29	76.00	3.29	.943
Mathematics	75.54	78.71	3.17	.197
Science	87.68	85.57	2.11	.869

School Location

This item addressed how the location of a school building might have an effect on student achievement. Specifically it addressed whether the school being located in or near high aircraft traffic, railroads, major highways or any other loud noise producing environment would effect student achievement. Ten of the respondents said they were in a high noise level area and no measures had been taken to reduce the noise with in the facility. These 10 respondents made up the substandard category. Thirty six responded "no" and made up the standard category. The percentage of students passing the English SOL test in the standard category was 2.60 percent higher those in the substandard category. In mathematics, the percentage of students passing the SOL test was 1.22 percent higher in the substandard than in the standard category. The percentage of students passing the science SOL test in the standard category was 2.42 percent higher those in the substandard category. Table 30 illustrates the differences discussed above.

Table 30

A Comparison of Student Passing Percentages on the Standards of Learning Tests and school location

Subject	No	Yes and no measures have taken to reduce the noise level within the facility	Difference	Significance
English	80.50	77.90	2.60	.634
Mathematics	76.28	77.50	-1.22	.466
Science	88.52	86.10	2.42	.445

Building Condition

This question asked the principals to give their overall assessment of the condition of their building. The choices were below standard, standard, and above standard. Fourteen principals rated their schools as below standard and 28 gave their schools an above standard rating. The substandard category consists of schools assessed as below standard. The schools rated as above standard by their principals made up the standard category. The percentage of students passing the English SOL test in the standard category was 4.51 percent higher than those in the substandard category. In mathematics, the percentage of students passing the SOL test was 4.75 percent higher in the standard than in the substandard building category. The percentage of students passing the science SOL test in the standard building category was 3.98 percent higher than those in the substandard building category. Table 31 below illustrates these differences.

Table 31

A Comparison of Student Passing Percentages on the Standards of Learning Tests and the building condition based on the perception of the principal

Subject	Above standard	Below standard	Difference	Significance
English	81.15	76.64	4.51	.931
Mathematics	76.68	71.92	4.75	.891
Science	89.26	85.28	3.98	.721

CHAPTER 5: SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

Introduction

Chapter five will address the research question, "What is the relationship between school building condition and student achievement?" This study was done on eighth grade students in the Commonwealth of Virginia. This chapter will also examine the findings, offer a discussion of the findings, and a conclusion based on those findings. An overall comparison of this study to the Cash (1993), Hines (1996), and Crook (2006) studies that focused on secondary schools in the Commonwealth of Virginia will be done. Additionally some comparisons in specifics areas to studies conducted in other states will also be done. The chapter will conclude with some recommendations for further study.

Summary

The tests results of eighth grade students in the Commonwealth of Virginia who participated in the Virginia Standards of Learning (SOL) Examinations in the 2005-2006 school year were used to examine the relationship between school building condition and student achievement at the middle school level. The theoretical model used by Cash (1993) and other shown in Figure 1 was also used in this study. This study addressed the relationship between building condition and student achievement. The building condition ratings were calculated from the responses provided by the principals on the Commonwealth Assessment of Physical Environment (CAPE). This instrument, designed to determine school building condition in the perception of the principal, has been successfully used in several other studies in the Commonwealth of Virginia. Most notable of these studies were Cash (1993), Hines (1996), and Crook (2006).

The results of the CAPE permit an overall classification of the condition of the building, which can be used to compare student performance. The items on the CAPE also were sub-divided into two major categories, structural and cosmetics. The availability of technology in the school was addressed on the instrument by the addition of four items. The CAPE was sent to all schools in the Commonwealth of Virginia who had given permission that taught eighth grade. These were primarily schools identified as middle schools by the Virginia Department of Education; however, because of the grade configuration in some school divisions, high schools and elementary schools that contained the eighth grade students were included in the study. Once the responses to the CAPE from the schools were received, the information was loaded into SPSS for analysis.

The schools were placed on a continuum of scores from highest to lowest and then were divided into quartiles based on the building condition score calculated from the responses of the principals to the CAPE. The schools in the lowest quartile were classified as substandard and schools in the highest quartile were classified as standard. This division allowed the researcher to determine the relationship between the condition of the building and student achievement by comparing the achievement of students in schools classified as substandard to the achievement of students in schools classified as standard.

The percent of students passing the Standards of Learning (SOL) Examination for the 2005-2006 school year was used to represent student achievement. The SOL results for eighth grade students on the English, mathematics, and science SOL examinations were used in this study. The English score is a composite of the reading and writing SOL

scores. The SOL scores for the students were adjusted for socioeconomic status to account for any effect that may have had on the student achievement. This was done through the use of the percent of students participating in the free and reduced lunch program for each school. The free and reduced information was obtained from the 2005-2006 Free and Reduced Price Lunch Program Eligibility Report portion of the Virginia Department of Education's School Nutrition Program (SNP) report.

Findings

The percentage of students passing the Commonwealth of Virginia Standards of Learning Examinations in English, mathematics, and science was used in this study. After the standard and substandard schools were identified, the percent of students passing the SOL examinations in the targeted subject areas for each school was computed. This information was used to compare student academic performance in the standard buildings to student academic performance in the substandard buildings to determine if there was a relationship between condition of the school building and student achievement. This study found that there is a relationship between building and student achievement.

First student achievement in the buildings was compared using the overall school building condition, which included all aspects of the school building in the comparison. Next the items on the CAPE were categorized as structural or cosmetic based on the area of the building or campus they targeted. Then student achievement was compared in the structural and cosmetic categories individually to determine the relationship to student performance. Finally student achievement was compared using the individual items on the CAPE to determine which, if any, individual items were related to student

achievement. Comparisons were also made of males and females in the overall, structural, and cosmetic categories to determine if building condition had a stronger relationship with one group more than the other. All of the comparisons mentioned above were done using the *t-test* to compare the percent of students passing the SOL examination in the schools identified as substandard to student performance in schools identified as standard. Both the *t-test* and the Pearson product-moment correlations indicated that the condition of school facilities had a significant association with student achievement when controlling for the SES of the student body.

When the comparison of student achievement using the *t-test* was made for the overall building condition, student performance on the SOLs were better in all three academic areas of the SOL examination in the buildings in the standard category than in those buildings in the substandard category. The difference in passing percentages of students in substandard and standard buildings in English was 3.89, in mathematics it was 2.22, while in science the difference in passing percentages was 3.86. These finding are consistent with the findings of other studies (Lewis, 2001; Earthman and Lemasters, 1996; & Cash, 1993). Lewis stated that "…facility condition may impact student performance more than many social and economic variables." Earthman and Lemasters stated that as facility conditions improve, achievement test scores improved. Cash found in her study that student achievement scores were higher in schools with better building conditions.

To compare student achievement based solely on the items identified on the CAPE as structural, the buildings were given a building condition score based on their responses to the structural items. The buildings were then divided into quartiles based on

the structural score and the standard and substandard buildings were identified. The comparison of student achievement in the buildings categorized as substandard to student achievement in the buildings categorized as standard showed that, as with the overall comparison, the percentage of students passing was higher in the buildings categorized as standard in all three academic areas of the SOL. The difference in passing percentages of students in substandard and standard buildings in English was 5.29, in mathematics it was 5.86, while in science the difference in passing percentages was 5.16 percentage points.

A comparison of student achievement also was made using the items on the CAPE that addressed cosmetic aspects of the building. To make this comparison, buildings were assigned a building condition score based on the principal's responses to the cosmetic items on the CAPE. Once the score was obtained, the buildings were divided into quartiles and the substandard and standard buildings were identified. The comparison of student achievement in the buildings categorized as substandard to student achievement in the buildings categorized as standard showed that the percentage of students passing was higher in the standard buildings in all three academic areas. The difference in percent of students passing in substandard and standard buildings in English was 4.77, in mathematics it was 6.47, while in science the difference in passing percentages was 5.13 percentage points.

Another finding related to school building condition and student achievement can be found when examining the differences in male and female performance on the SOLs in the standard and substandard categories. Both genders generally performed better in the standard schools than in the substandard school. A greater percentage of females performed better in English and mathematics while a greater percentage of males

performed better in science in the standard schools than those students in substandard schools. The study also showed that building condition appeared to have a greater relationship to female performance than male performance. An examination of the passing percentages in the overall, structural, and cosmetic building conditions showed that the difference in passing percentage was almost always greater for females than males.

In the overall building condition category the differences in percent of students passing in substandard and standard schools in English were 4.59 percent for females and 1.43 percent for males, in mathematics they were 2.82 percent for females and 0.47 for males, and in science they were 4.24 percent for females and 2.85 percent for males.

In the structural area the differences in percent of student passing in English were 4.72 percent for females and 5.75 percent for males, in mathematics the differences were 7.35 percent for females and 4.75 for males, and in science the differences were 6.22 percent for females and 2.51 percent for males. The difference in passing percentage of 6.22 for females in science was statistically significant at the <.05 level.

In the cosmetic area the differences in percent of students passing in English were 3.90 percent for females and 6.28 percent for males, in mathematics the differences were 8.04 percent for females and 5.22 for males, and in science the differences were 4.37 percent for females and 5.64 percent for males.

The largest difference in performance between standard and substandard schools for females occurred in mathematics in both the structural and cosmetics areas. For males the largest differences occurred in English in the structural and cosmetics areas.

An examination of the individual building factors as represented by the 33 items on the CAPE revealed a relationship between student achievement and school building condition in several areas.

1. Building Age. When looking at the comparison of student performance in standard schools (buildings 19 years old or less) and substandard schools (buildings 40 years or older), students performed better in all three academic areas in the standard schools. With the emphasis and wide use of technology in schools today, it would be expected that a higher percentage of students in newer buildings would have better academic performance on SOLs than in older builders because of the amount of technology available. The greatest difference in percent of students passing was 6.10 percentage points in English and 4.18 percentage points in science. The large influence building age has on English performance is noteworthy, as O'Neill noted in his 2001 study, because of the effect reading ability has student performance in other subject areas. Lewis (2001) also noted that "Reading scores are the single most accurate indicators of the ability to do academic work." This finding is consistent with the findings in several other research studies (Cash, 1993; Hines, Earthman & Lemasters, 1996; O'Neill, 2001; Stevenson, 2001; Earthman, 2002), which indicated that students in newer buildings perform at a higher level than students in older buildings. Older buildings usually do not have the main attributes of a modern building that are associated with a positive physical environment conducive to student learning (Earthman & Lemasters, 1996). Many of the building factors that are necessary for proper learning environments are simply absent in older buildings, but are

present and functioning in new buildings (Earthman, 2002). Old buildings cannot compare with new ones in terms of facility quality (O'Neill, 2001).

2. Windows. In comparing student performance in standard versus substandard buildings, the percent of students passing on SOL examinations was higher in English and science in standard schools, which had windows in at least three-fourth of the instructional spaces, than in substandard schools, which had windows in less than one-fourth of the instructional spaces This finding is consistent with the findings of the study conducted by the Heschong Mahone Group (1999) where they found that students in classrooms with the largest window areas progressed 23% faster in reading than those with the least window area. This study also found that students in classrooms where windows could be opened progressed 7-8% faster than those in classrooms with fixed windows.
3. Air Conditioning. When looking at the comparison of student performance in standard schools where buildings that have air conditioning in all academic areas and it can be regulated and substandard schools where buildings have no air conditioning in the academic areas, students performed better in all three academic areas in the standard schools. This finding was similar to findings in this area in most previous studies. The greatest differences in passing percentages were in English and science. This finding is consistent with Cash's study (1993) where she stated that as the quality and level of air conditioning increased, the mean scales also increased.
4. Graffiti. When looking at the relationship between the presence of graffiti and student performance, students scored higher in all academic areas when there was

no graffiti present. This result was similar to findings in previous studies and was expected in the present study. The greatest difference was in English and science where the percent of students passing in standard buildings was compared with percent of students passing in substandard buildings.

5. Lighting. In this study, as in previous studies, when substandard buildings that had predominately hot fluorescent lighting were compared to standard buildings that had cold fluorescent lighting, the percentage of students performing well on their SOL examinations was greater in standard buildings than in substandard buildings in all academic areas. The differences between students in the two categories of buildings in the percentage of students passing the SOL examination were highest in science.
6. School grounds. In this study the responses to this item were consistent with the other items in that the percentage of students passing the SOL examination were higher in all academic areas in the standard buildings than in the substandard buildings. These results would be expected because school and community pride usually had an effect on student performance. This was different from the Crook study where the percentage of students passing the SOL was higher in substandard schools.
7. Building Condition. This item asked the principals to rate their buildings as below standard, standard, or above standard. Students in the buildings rated as above standard by their principal performed better in all academic areas than students in buildings rated as below standard by the principal. The ratings given to buildings are strictly the opinion of the principals, but based on the performance of the

students on the SOLs, it would appear that their opinions are correct and the responses to this item would indicate that building condition does have an effect on student achievement. The finding in this study of the relationship between how principal rate their building and student achievement is consistent with the findings in the Stevenson (2001) study which stated that most building administrators believed that the condition of the school facility has a direct connection with how well students perform academically. The Stevenson study also found that the principals felt that if the condition of the facilities are poor, they must spend valuable time trying to correct problems, thereby having less time to devote to the instructional program, interacting with teachers, and being in classrooms

Conclusion

The data from this study show that there is a positive relationship between school building condition and student achievement at the middle school level in the Commonwealth of Virginia. The differences in percentage of students passing the Standards of Learning Examinations in standard and substandard school buildings are higher in some areas of the SOL Examination than others, but there is a definite overall positive relationship between school building condition and student achievement. The data also showed a positive relationship between the structural and cosmetic conditions of the building and student achievement. Finally the data from this study showed that the differences in passing percentages varied between females and males. Generally the differences in passing percent appeared to be higher among females than male in most areas.

An examination of some individual aspect of buildings showed that some areas in the building influenced student achievement more than others. The age of the buildings had an influence on reading. This is an area of particular interest because of the effect reading has on student success in other academic areas. As stated earlier, the results of this study supports the findings of other studies showing that there a relationship between building condition and student achievement.

Discussion

The data in this study clearly show that a positive relationship exist between school building condition and student achievement. That relationship is stronger among females on some subtests and stronger among males on other subtests. The greatest difference in passing percentage occurred among females in mathematics when comparing students in standard schools to substandard schools in the cosmetic category. The greatest difference in passing percentage occurred among males in English when comparing standard schools to substandard schools in the cosmetic category.

In the overall building condition the greatest difference in passing percentage, 4.59 percentage points, occurred in English among female students when comparing student performance in standard schools to substandard schools. When looking at the structural condition of schools, the greatest difference in passing percentage, 7.35 percent, occurred in mathematics among female students when comparing student performance in standard schools to substandard schools. When comparing students in standard schools to students in substandard school in the cosmetic conditions the greatest difference in passing percentage, 8.04 percent, occurred in mathematics among female students.

It should be noted that when looking at the total student population, not separating male and female, students performed better in standard schools than students in substandard schools on all subtests. The greatest difference in the percentage of students passing the SOLs between standard and substandard buildings in the overall school condition was 3.89 percentage points in English. In the structural category the greatest difference, 5.86 percentage points, occurred in mathematics. In the structural category the greatest difference, 6.47 percentage points, also occurred in mathematics.

These results show that many schools are who missing state accreditation or failing to meet the minimum requirements for No Child Left Behind (NCLB) by a few points may be the victims of poor building conditions.

Comparison to Previous Research Studies

A comparison was done between this study and the Cash (1993), Hines (1996), and Crook (2006) studies. It should be noted that all of these studies were done at the high school level. It should also be noted that the Cash and Hines studies used the Test of Academic Proficiency to measure student achievement and that those studies used percentile ranks to record differences. The Crook study, like this study, used the percentage of students passing the Standards of Learning Examination to measure student achievement. Although these differences did exist, there were many similarities in the results. All of the studies showed that a relationship does exist between school building condition and student achievement.

When making the comparison of this study with the previous studies, a major consideration that must be kept in mind is that this study was done at the middle level and all of the previous studies were at the high school level. Another consideration is that the

SOL results show the percentage of students that passed that test at each individual school. Cash and Hines used the Tests of Academic Proficiency, which are national norm referenced standardized tests. The mean score of these tests were based on national passing means.

In comparing the results of this study and the previous studies on schools in the Commonwealth of Virginia, several similarities were noted. In this study the passing percentage was higher among students in standard schools than students in the substandard schools in all academic areas. This was true for the overall, structural, and cosmetics categories.

In the Cash (1993) study all components of the TAP achievement percentile ranks were higher in the standard schools than in the substandard schools in the overall building condition. The Hines (1996) study also showed that TAP achievement percentile ranks were higher in the standard schools than in the substandard schools. In the Crook (2006) study, where the percentage of students passing the SOLs were used to measure student achievement as the current study did, the percentage of students passing the SOLs were higher in the standard buildings than in the substandard buildings in English and Algebra II. In Algebra I and Geometry the percentage of students passing the SOLs were higher in the substandard buildings than in the standard buildings. In this study the percentage of students passing the SOLs were higher in the standard buildings than in the substandard buildings in all three academic areas. Table 32 illustrates the comparison of the studies.

Table 32

Comparison of differences in achievement percentile rank scores and percent of students passing the SOL tests in standard and substandard buildings in the overall building condition category

Subject	Cash (1993) (TAP)	Hines (1996) (TAP)	Crook (2006) (SOL)	Bullock (2006 SOL)
Reading Comprehension	+4	+15	6.6	
Math Application	+4	+17		2.22
Language/Writing	+2	+9	5.5	3.89*
Sources of Info	+4	+13		
Basic Composite	+4	+13		
Social Science	+3	+11		
Science	+5	+9		3.86
Total Composite	+5	+14		
Algebra I			-1.5	
Algebra II			2.5	
Geometry			-1.1	

*English SOL subtest includes both reading and writing

In the Cash (1993) study all components of the TAP achievement percentile ranks were higher in the standard schools than in the substandard schools in the structural building condition. The Hines (1996) study also showed that TAP achievement percentile ranks were higher in the standard schools than in the substandard schools. In the Crook (2006) study, the percentage of students passing the SOLs was higher in the standard buildings than in the substandard buildings in English, Algebra II, and Geometry. The percentage of students passing the SOLs in Algebra I was again higher in the substandard buildings than in the standard buildings. In this study the percentage of students passing the SOLs were higher in the standard buildings than in the substandard buildings in all three academic areas. Table 33 illustrates the comparison of the studies.

Table 33

Comparison of differences in achievement percentile rank scores and percent of students passing the SOL tests in standard and substandard buildings in the structural building condition category

Subject	Cash (1993) (TAP)	Hines (1996) (TAP)	Crook (2006) (SOL)	Bullock (2006 SOL)
Reading Comprehension	+4	+8	6.7	
Math Application	+4	+9		5.86
Language/Writing	+2	+5	7.0	5.29*
Sources of Info	+4	-1		
Basic Composite	+4	+7		
Social Science	+3	+7		
Science	+5	+7		5.16
Total Composite	+5	+9		
Algebra I			-2.8	
Algebra II			1.3	
Geometry			1.2	

*English SOL subtest includes both reading and writing

In the Cash (1993) study all components of the TAP achievement percentile ranks were higher in the standard schools than in the substandard schools in the cosmetic building condition. The Hines (1996) study also showed that TAP achievement percentile ranks were higher in the standard schools than in the substandard schools. In the Crook (2006) study, the percentage of students passing the SOLs was higher in the standard buildings than in the substandard buildings in English and Algebra II. As in the overall building condition, the percentage of students passing the SOLs in Algebra I and Geometry were higher in the substandard buildings than in the standard buildings. In this study the percentage of students passing the SOLs were higher in the standard buildings than in the substandard buildings in all three academic areas. Table 34 illustrates the comparison of the studies.

Table 34

Comparison of differences in achievement percentile rank scores and percent of students passing the SOL tests in standard and substandard buildings in the cosmetic building condition category

Subject	Cash (1993) (TAP)	Hines (1996) (TAP)	Crook (2006) (SOL)	Bullock (2006 SOL)
Reading Comprehension	+4	+5	6.6	
Math Application	+4	+4		6.46
Language/Writing	+2	+4	5.5	4.76*
Sources of Info	+4	0		
Basic Composite	+4	+5		
Social Science	+3	+4		
Science	+5	+5		5.12
Total Composite	+5	+6		
Algebra I			-1.5	
Algebra II			2.5	
Geometry			-1.1	

*English SOL subtest includes both reading and writing

Study Concerns

A major concern of this study is the Standards of Learning (SOL) data used in the study. The percentage of students passing can be misleading because the actual number of students that took the test is not included. Some comparisons may be between a school that has an eighth grade class of 400 students and a school that has an eighth grade class of 50 students. Additionally ninety-five percent of the eligible student population is required to test in a given school. This means a significant number of students, five percent, could be left out in a large school or school division versus a small number in a small school or school division.

Another concern is the use of percentage of students passing the SOL tests versus use of the actual scores on those tests. Scale scores would have provided more accurate data because they are scores of actual students and not a group of students.

The accuracy of the data being reported by the principals is another concern. Some principals may not want to reveal the actual condition of their school because of a sense of loyalty or pride in their school. Some principals may not want to let other people know the poor condition of their school building.

In looking at studies that addressed the effect of windows on student achievement, the effect of daylight and skylights were addressed in some studies. The study conducted by the Heschong Mahone Group (1999) found that students performed better in instructional areas that had more skylights and daylight. The CAPE instrument does not address the issue of daylight and skylights. An item could be added to the CAPE to address the area of daylight and its effect on student achievement.

The final concern is the accuracy of the comparison of the results of this study to the studies of Cash (1993), Hines (1996), and Crook (2006). The main concern is that all of those studies were at the high school level and this study was at the middle school. The other concern is that the Cash and Hines studies are 14 and 11 years old respectively. Many school buildings could have been replaced or updated during that time. The definition of what would have been considered a good or acceptable school building 11-14 years ago is not what would be considered a good or acceptable school building today. The expectations of parents and school officials for school facilities have also changed.

Finally the tests used by Cash and Hines, Test of Academic Proficiency (TAP), were also different from the SOL Examinations. This makes the comparison somewhat difficult.

Recommendations for Further Study

The following recommendations for further studies are offered.

1. Conduct a study at the middle school level of school building conditions and student achievement in schools in urban/suburban areas versus schools in rural areas. The Cash and Hines studies showed that even though there was positive relationship between school building condition and student achievement both small rural schools and large urban/suburban schools, the amount of difference in student achievement was not the same. It would be beneficial to study the question of school location and students achievement at middle school level.
2. A study could be done on student achievement and school building design. When the middle school concept began, many elementary and high schools were converted to middle schools. The buildings did not fit the design of an ideal

middle school where there would be a separate wing for each grade and there would be very little, if any, interaction between students from different grade levels. Since the middle school concept began there have been many schools built to fit this middle model. A study could be done using school designed as middle schools and those middle schools be housed in converted high schools and elementary buildings to determine if there is a difference in student achievement. It would be interesting to see if student achievement in these schools designed to fit this middle school model made a different in student achievement.

3. A study could be done regionally or nationally at the middle school level comparing the results of studies in other state of the relationship of school building condition and student achievement to see if the results are the similar. It would be interesting to compare the results of state studies in a particular region of the country to see if the same issues exist and how it is being addressed.
4. An in-depth study could be done addressing the relationship of school building condition and its effect on different genders and different nationalities/races. This study showed that males and females were effected differently by the condition of the school building. This should be studied in more detail to see if minority males are affected more or less than non-minority males and the same study for females.

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Appendix A

Summary of the Values of CAPE Responses

Questions	Possible Responses	Values	Lowest Score	Highest Score
2	A	1	1	3
	B	2		
	C	3		
3	A	1	1	3
	B	2		
	C	3		
4	A	1	1	3
	B	2		
	C	3		
5	A	1	1	3
	B	2		
	C	3		
6	A	1	1	3
	B	2		
	C	3		
7	A	1	1	3
	B	2		
	C	3		
8	A	1	1	3
	B	2		
	C	3		
9	A	1	1	3
	B	2		
	C	3		
10	A	1	1	3
	B	2		
	C	3		
11	A	1	1	3
	B	2		
	C	3		

Appendix A (continued)

Summary of the Values of CAPE responses

Questions	Possible Responses	Values	Lowest Score	Highest Score
12	No	0	0	10
	Yes	1		
13	A	1	1	3
	B	2		
	C	3		
14	A	1	1	3
	B	2		
	C	3		
15	No	2	8	16
	Yes	1		
16	A	1	1	3
	B	2		
	C	3		
17	A	1	1	3
	B	2		
	C	3		
18	A	1	1	3
	B	2		
	C	3		
19	A	1	1	3
	B	2		
	C	3		
20	A	1	1	3
	B	2		
	C	3		
21	A	1	1	3
	B	2		
	C	3		

Appendix A (continued)

Summary of the Values of CAPE responses

Questions	Possible Responses	Values	Lowest Score	Highest Score
22	A	1	1	3
	B	2		
	C	3		
23	A	1	1	3
	B	2		
	C	3		
24	A	1	1	3
	B	2		
	C	3		
25	A	1	1	3
	B	2		
	C	3		
26	No	1	1	2
	Yes	2		
27	No	1	1	2
	Yes	2		
28	No	1	1	2
	Yes	2		
29	No	1	1	2
	Yes	2		
30	A	1	1	3
	B	2		
	C	3		

Appendix B
Overall Building Condition Scores and Building Categories

School Number	Overall CAPE Score	Category	School Number	Overall CAPE Score	Category
1	49	Substandard	29	61	Substandard
2	51	Substandard	30	62	
3	52	Substandard	31	62	
4	53	Substandard	32	62	
5	54	Substandard	33	62	
6	54	Substandard	34	63	
7	54	Substandard	35	63	
8	54	Substandard	36	63	
9	55	Substandard	37	63	
10	56	Substandard	38	63	
11	57	Substandard	39	64	
12	57	Substandard	40	64	
13	57	Substandard	41	64	
14	57	Substandard	42	64	
15	58	Substandard	43	64	
16	58	Substandard	44	65	
17	58	Substandard	45	65	
18	58	Substandard	46	65	
19	59	Substandard	47	65	
20	59	Substandard	48	65	
21	59	Substandard	49	65	
22	59	Substandard	50	65	
23	60	Substandard	51	65	
24	60	Substandard	52	66	
25	60	Substandard	53	66	
26	61	Substandard	54	66	
27	61	Substandard	55	66	
28	61	Substandard	56	68	

Appendix B (continued)
Overall Building Condition Scores and Building Categories

School Number	Overall CAPE Score	Category	School Number	Overall CAPE Score	Category
57	68		85	72	Standard
58	68		86	72	Standard
59	68		87	72	Standard
60	68		88	72	Standard
61	68		89	72	Standard
62	69		90	72	Standard
63	69		91	73	Standard
64	69		92	73	Standard
65	70		93	73	Standard
66	70		94	73	Standard
67	70		95	74	Standard
68	70		96	74	Standard
69	70		97	75	Standard
70	70		98	75	Standard
71	70		99	76	Standard
72	70		100	76	Standard
73	70		101	76	Standard
74	70		102	77	Standard
75	70		103	77	Standard
76	70		104	77	Standard
77	70		105	77	Standard
78	71		106	77	Standard
79	71		107	78	Standard
80	71		108	78	Standard
81	71		109	78	Standard
82	71		110	78	Standard
83	71		111	78	Standard
84	71				

Appendix C
Structural Building Condition Scores and Building Categories

School Number	Structural CAPE Score	Category	School Number	Structural CAPE Score	Category
1	18	Substandard	29	25	Substandard
2	20	Substandard	30	26	
3	20	Substandard	31	26	
4	20	Substandard	32	26	
5	20	Substandard	33	26	
6	21	Substandard	34	26	
7	22	Substandard	35	26	
8	22	Substandard	36	26	
9	22	Substandard	37	26	
10	23	Substandard	38	27	
11	23	Substandard	39	27	
12	23	Substandard	40	27	
13	23	Substandard	41	27	
14	24	Substandard	42	28	
15	24	Substandard	43	28	
16	24	Substandard	44	28	
17	24	Substandard	45	28	
18	24	Substandard	46	28	
19	24	Substandard	47	28	
20	24	Substandard	48	28	
21	24	Substandard	49	28	
22	24	Substandard	50	28	
23	24	Substandard	51	28	
24	24	Substandard	52	28	
25	24	Substandard	53	28	
26	24	Substandard	54	28	
27	24	Substandard	55	28	
28	24	Substandard	56	29	

Appendix C (continued).
Structural Building Condition Scores and Building Categories

School Number	Structural CAPE Score	Category	School Number	Structural CAPE Score	Category
57	25		85	31	Standard
58	29		86	32	Standard
59	29		87	32	Standard
60	29		88	32	Standard
61	29		89	32	Standard
62	29		90	32	Standard
36	29		91	32	Standard
46	29		92	33	Standard
56	29		93	33	Standard
66	29		94	33	Standard
67	29		95	33	Standard
68	29		96	33	Standard
69	29		97	33	Standard
70	29		98	33	Standard
71	30		99	33	Standard
72	30		100	34	Standard
73	30		101	34	Standard
74	30		102	34	Standard
75	30		103	34	Standard
76	30		104	34	Standard
77	30		105	35	Standard
78	30		106	35	Standard
79	30		107	35	Standard
80	30		108	35	Standard
81	31	Standard	109	35	Standard
82	31	Standard	110	35	Standard
83	31	Standard	111	35	Standard
84	31	Standard			

Appendix D
Cosmetic Building Condition Scores and Building Categories

School Number	Cosmetic CAPE Score	Category	School Number	Cosmetic CAPE Score	Category
1	37	Substandard	29	46	
2	37	Substandard	30	46	
3	39	Substandard	31	46	
4	39	Substandard	32	46	
5	40	Substandard	33	46	
6	40	Substandard	34	46	
7	40	Substandard	35	47	
8	41	Substandard	36	47	
9	42	Substandard	37	47	
10	42	Substandard	38	47	
11	42	Substandard	39	47	
12	42	Substandard	40	48	
13	42	Substandard	41	48	
14	43	Substandard	42	48	
15	43	Substandard	43	48	
16	43	Substandard	44	48	
17	44	Substandard	45	48	
18	44	Substandard	46	48	
19	44	Substandard	47	48	
20	44	Substandard	48	48	
21	44	Substandard	49	48	
22	44	Substandard	50	48	
23	45	Substandard	51	49	
24	45	Substandard	52	49	
25	45	Substandard	53	49	
26	45	Substandard	54	49	
27	45	Substandard	55	49	
28	45	Substandard	56	49	

Appendix D (continued).
Cosmetic Building Condition Scores and Building Categories

School Number	Cosmetic CAPE Score	Category	School Number	Cosmetic CAPE Score	Category
57	49		85	53	Standard
58	49		86	53	Standard
59	49		87	53	Standard
60	49		88	53	Standard
61	50		89	53	Standard
62	50		90	54	Standard
63	50		91	54	Standard
64	50		92	54	Standard
65	50		93	54	Standard
66	50		94	54	Standard
67	50		95	54	Standard
68	50		96	54	Standard
69	50		97	54	Standard
70	51		98	54	Standard
71	51		99	55	Standard
72	51		100	55	Standard
73	51		101	55	Standard
74	51		102	55	Standard
75	51		103	55	Standard
76	52		104	55	Standard
77	52		105	55	Standard
78	52		106	55	Standard
79	52		107	55	Standard
80	52		108	55	Standard
81	52		109	57	Standard
82	52		110	59	Standard
83	52		111	60	Standard
84	52				

Appendix E

Synthesis of Research on School Building Condition and Student Achievement

Author	Date	Factors relating to school building and student achievement	Type of study data source	Findings
Branham, D.	2002	School Infrastructure	Research Study	This study found that school infrastructure has a critical impact on student achievement. A superb school building with up-to-date facilities brings an atmosphere of high student achievement.
Cash, C.	1993	School Building Condition	Dissertation	The condition of the school facility has a positive impact on Student achievement at the high school level in the Commonwealth of Virginia.
Crampton, F., Thompson, D. and Vesely, R.	2004	Funding for school infrastructure	Professional Article	With the critical role the physical environment of schools have in student success, adequate and equitable funding of nfrastructure takes on a new urgency. In today's environment of high -stakes testing, educators must make use of every tool, including capital dollars to enhance student achievement.

Appendix E (continued).

Synthesis of Research on School Building Condition and Student Achievement

Author	Date	Factors relating to school building and student achievement	Type of study data source	Findings
Crook, J.	2006	School building condition	Dissertation	The condition of the school facility has a positive impact on student achievement at the high school level in the Commonwealth of Virginia.
Earthman, G.	1998	Educational facilities student achievement, student behavior	Professional presentation	The data presented in this paper leads one to the knowledge that the condition of the school building has an influence on student performance.
Earthman, G.	2002	School facilities condition	Research report	The conclusion of this study is that school facility conditions has an influence on student academic achievement. Students who attend school in substandard buildings are handicapped in their academic achievement.

Appendix E (continued).

Synthesis of Research on School Building Condition and Student Achievement

Author	Date	Factors relating to school building and student achievement	Type of study data source	Findings
Earthman, G & Lemasters, L.	1996	Building environment	Research review	All of the studies in this research review revealed a relationship between student performance, both achievement and behavior, and the condition of the building.
Gertel, S., McCarty, P., & Schoff, L.	2004	The optimum acoustical learning environment	Research study	The optimum learning area is critically based on auditory-verbal responses. Classroom noise not only interfere with the student's ability to hear the teacher, but it contributes to students feeling powerless over the classroom environment and gives up on trying to learn.
Hines, E.	1996	School building condition	Dissertation	The condition of the school facility has a positive impact on student achievement at the high school level in the Commonwealth of Virginia.

Appendix E (continued).

Synthesis of Research on School Building Condition and Student Achievement

Author	Date	Factors relating to school building and student achievement	Type of study data source	Findings
Lackney, J.	1999	Condition of physical environment on the education process	Professional presentation	Develop a process in all school districts to determine the environmental qualities that contribute to achievement and improve those qualities.
Lair, S.	2003	School building condition	Dissertation	The condition of the school facility has a positive impact on student achievement in the State of Texas.
Lanham, J.	1999	School building condition	Dissertation	This study found that a positive relationship exist between school building and student achievement at elementary schools in the Commonwealth of Virginia.
Lemasters, L.	1997	Research review	Dissertation	This study reviewed several studies. The conclusion, after reviewing and comparing the studies and several individual components, was that building does have an impact student achievement.

Appendix E (continued).

Synthesis of Research on School Building Condition and Student Achievement

Author	Date	Factors relating to school building and student achievement	Type of study data source	Findings
Lewis, M.	2001	Building condition and student test scores	Dissertation	Facility condition was found to be a stronger predictor of academic achievement than many family background factors and socioeconomic conditions.
Lyons, J.	2001	School building condition and student achievement	Review and analysis of research	The research shows that older buildings may pose a variety of negative consequences for the learning process, while safe and modern schools with controlled environments enhance learning.
Moore, D., and Warner, E.	1998	Upgraded facilities and student achievement	Research study	In this study an analysis of math and science scores of third and sixth grade students for an 11-12 year period surrounding school renovations was done. The findings revealed a correlation between newer facilities and student performance levels.

Appendix E (continued).

Synthesis of Research on School Building Condition and Student Achievement

Author	Date	Factors relating to school building and student achievement	Type of study data source	Findings
O'Neill, D.	2000	School Building	Research study	The data gathered in this study indicated that a positive relationship between building condition and achievement of students exist. Student achievement was higher in newer buildings. The physical structure and condition of a building has the potential to inspire the nature, quality, and direction of what goes on inside.

Appendix F

Date

Dear

A am currently doing research in cooperation with the Division of Educational Leadership and Policy Studies at Virginia Polytechnic and State University. My research involves a study of the relationship between the condition of the school facility and the performance of students on the Virginia Standards of Learning Examination for middle school students in the Commonwealth of Virginia.

The purpose of this study is to determine if there is a relationship among these variables. With the role that the Standards of Learning Examinations play in school accreditation at the state level and the Adequately Yearly Progress component of No Child Left Behind, it is important that we identify any barrier that may be preventing students from performing at their highest level. As the average age of schools hover around 40 years old, it is imperative that we conduct this research to determine if there is a relationship between the condition of educational facilities and student performance on the Standards of Learning Examinations.

In order to complete this research, data on the building condition will be needed. The current condition of school facilities will be determined by the information provided by your Middle School Principals through completion of the Commonwealth Assessment of Physical Environment facilities assessment instrument. The survey consists of 32 questions and should take approximately 15 – 20 minutes to complete.

The names of the participating schools will not be identified in this study, however they will be listed in the appendix. The intent of the report is not to compare schools, but to look at the targeted relationship.

To grant permission for this study to be conducted in your school division, simply reply: “Permission Granted” or “Yes” to this email. Your cooperation is greatly appreciated.

If you have any questions or require clarification, please call me at Windsor Middle School at 757-242-3229 or on my cell at 757-620-9555.

Sincerely,

Calvin Bullock
Candidate for Doctoral Degree
Virginia Polytechnic and State University

Glen I. Earthman
Professor Emeritus
Virginia Tech.

Appendix G

Date

Dear

My name is Calvin Bullock. I am currently doing research in cooperation with the Division of Educational Leadership and Policy Studies at Virginia Polytechnic and State University. My research involves a study of the relationship between the condition of the school facility and the performance of students on the Virginia Standards of Learning Examination for middle school students in the Commonwealth of Virginia.

The purpose of this study is to determine if there is a relationship among these variables. With the role that the Standards of Learning Examinations play in school accreditation at the state level and the Adequately Yearly Progress component of No Child Left Behind, it is important that we identify any barrier that may be preventing students from performing at their highest level. As the average age of schools hover around 40 years old, it is imperative that we conduct this research to determine if there is a relationship between the condition of educational facilities and student performance on the Standards of Learning Examinations.

In order to complete this research, data on the building condition will be needed. The current condition of school facilities will be determined by the information provided by you through your completion of the Commonwealth Assessment of Physical Environment facilities assessment instrument. The survey consists of 32 questions and should take approximately 15 – 20 minutes to complete.

The names of the participating schools will not be identified in this study, however they will be listed in the appendix. The intent of the report is not to compare schools, but to look at the targeted relationship.

To access the assessment instrument, click on the following web link: http://www.surveymonkey.com/Users/83148542/Surveys/638012450339/845B19F2-FAC1-4314-898E. Upon completion, simply click submit and the results will be automatically tallied. Thank you in advance.

If you have any questions or require clarification, please call me at Windsor Middle School at 757-242-3229 or on my cell at 757-620-9555.

Sincerely,

Calvin Bullock
Candidate for Doctoral Degree
Virginia Polytechnic and State University

Glen I. Earthman
Professor Emeritus
Virginia Tech.

Appendix H

Date

Dear

My name is Calvin Bullock. I am the principal of Windsor Middle School in Windsor, VA.

I am conducting a research project in cooperation with the Division of Educational Leadership and Policy Studies at Virginia Polytechnic and State University (Virginia Tech). My research involves a study of the relationship between the condition of the school building and the performance of eighth (8^{th}) students in the Commonwealth of Virginia on the Virginia Standards of Learning Examination.

The purpose of this study is to determine if there is a relationship among these variables. With the role that the Standards of Learning Examinations play in school accreditation, it is important that we identify any barriers that may be preventing students from performing at their highest level. As the average age of schools hover around 40 years old, it is imperative that we conduct this research to determine if there is a relationship between the condition of educational facilities and student performance on the Standards of Learning Examinations.

In order to complete this research, data on the building condition will be needed. The current condition of school facilities will be determined by the information provided by you through your completion of the Commonwealth Assessment of Physical Environment (CAPE) facilities assessment instrument. **The survey consists of 33 questions and should take approximately 15 minutes to complete.**

The names of the participating schools will not be identified in this study.

I have attached a copy of the CAPE assessment for your school. Please take a few minutes to complete it and return it to me in the self addressed stamped envelope.

If you have any questions or require clarification, please call me at Windsor Middle School at 757-242-3229 or on my cell at 757-620-9555. Thank you in advance for your time and cooperation.

Sincerely,

Calvin Bullock
Candidate for Doctoral Degree
Virginia Tech.

Glen I. Earthman
Professor Emeritus
Virginia Tech.

Appendix I

Commonwealth Assessment of Physical Environment

Introduction

Thank you for agreeing to complete the CAPE assessment instrument to rate your school. Please feel free to make any comments in the space provided to clarify or express your concern.

1. Please complete the following information.
   School Name:
   School Division:
   Principal's Name:

2. What is the age of the school building in number of years? A facilities age is your best estimate of the time period during which most of the space used by students was built.
   ☐ a. 40-60 years old or older
   ☐ b. 20-39 years old
   ☐ c. 0-19 years old

3. Are windows visible in each instructional area?
   ☐ a. Windows are fewer that 1/4th of the instructional spaces
   ☐ b. Windows are in at least 1/4th, but fewer than 3/4ths of the instructional spaces
   ☐ c. Windows are in at least 3/4ths of the instructional spaces

4. What kind of flooring is found in the majority of the instructional areas?
   ☐ a. Wood floor
   ☐ b. Tile or terrazzo
   ☐ c. Carpet

5. What quality of heat is found in the majority of the instructional spaces?
   ☐ a. Uneven heat/unable to control in each room
   ☐ b. Even heat/unable to control in each room
   ☐ c. Even heat/able to control in each room

6. What quality of air conditioning system is found in the majority of the instructional spaces?
   ☐ a. No air conditioning available
   ☐ b. Air conditioning in some instructional spaces, or air conditioning in all instructional spaces, but not well regulated
   ☐ c. Air conditioning in all instructional spaces which can be well regulated

7. When was the last time the interior walls, including classroom spaces, were painted?

☐ a. Over 15 years ago
☐ b. Between 8 and 15 years
☐ c. Less than 8 years ago

8. Is there a regularly scheduled painting cycle for interior walls? Is so, what is it?

☐ a. No
☐ b. Yes, over 8 year cycle
☐ c. Yes, 8 year or fewer year cycle

9. When was the last time the exterior walls or windows and trim, were painted?

☐ a. Over 7 years ago
☐ b. Between 4 and 7 years
☐ c. Within the last 4 years or no exterior surface requires exterior surface painting

10. Is there a regularly scheduled painting cycle for exterior walls, or windows & trim? If so, what is it?

☐ a. No
☐ b. Yes; Over 7 year cycle
☐ c. Yes; 7 year or fewer year cycle or not needed because no exterior surface requires periodic painting

11. Are there indications of roof leaks in the building?

☐ a. Ceiling is deteriorating due to water damage, and / or water falls in some areas of the facility requiring buckets for water collection
☐ b. Ceiling is currently developing a few stains due to minor leaks
☐ c. No visible signs, or only a few old water spots in ceiling

12. Which of the following facilities are adjacent to, or part of, the school complex? Please check all that apply.

☐ a. Football stadium
☐ b. Football field
☐ c. Soccer field
☐ d. Tennis courts
  ☐ i. 1-2
  ☐ ii. 3-5
  ☐ iii. Over 5
☐ e. Swimming pool
☐ f. Softball field
☐ g. Wrestling room
☐ h. Weight room

13. How often are classroom floors swept (if wood, tile or terrazzo) or vacuumed (if carpeted)?

☐ a. Monthly
☐ b. Weekly
☐ c. Daily or more frequently

14. How often are classroom floors mopped (if wood, tile or terrazzo) or cleaned (if carpeted)?

☐ a. Annually
☐ b. Monthly
☐ c. Daily or weekly

15. Is graffiti commonly found on premises?

a. Bathrooms	☐Yes	☐No
b. Lockers	☐Yes	☐No
c. Hallways	☐Yes	☐No
d. Classroom walls/doors	☐Yes	☐No
e. Other interior areas	☐Yes	☐No
Please Specify:		
f. Exterior walls	☐Yes	☐No
g. Exterior walkways	☐Yes	☐No
h. other exterior surfaces	☐Yes	☐No
Please Specify:		

16. How long does the graffiti remain before it is removed?

☐ a. Until summer maintenance
☐ b. More than a week, less than a month
☐ c. Less than a week or no to all parts of #14

17. What is the condition of the lockers?

☐ a. Most are not functional or not in good repair
☐ b. At least three-fourths of the lockers are functional and in good repair
☐ c. Over three-fourths of the lockers are functional and in good repair

18. What type of material is used for the majority of interior classroom ceilings?

☐ a. Wood or open beams
☐ b. Plaster or acoustical tiles in at least three/fourths of the instructional spaces
☐ c. Acoustical tiles throughout the instructional spaces

19. Please indicate which utilities or equipment are available and in usable condition in the science labs?

☐ a. Sinks & Water
☐ b. Sinks, Water & Electricity
☐ c. Sinks, Water, Electricity, & Gas

20. How long ago was science equipment updated to current standards?

☐ a. Over 10 years ago
☐ b. Between 5 and 9 years ago
☐ c. Less than 5 years ago or the building is less than 5 years old

21. What type of lighting is available in the instructional areas?

☐ a. Incandescent lighting
☐ b. Fluorescent lighting– hot
☐ c. Fluorescent lighting– cold

22. What is the condition of the classroom furniture?

☐ a. Most rooms have furniture that is either facially scarred or functionally damaged
☐ b. Though at least half the rooms may have some minor facial scars on the student desks, all the furniture is functionally sound and looks satisfactory
☐ c. All the classrooms have furniture which is functionally sound and facially attractive

23. What is the condition of the school grounds?

☐ a. There is no landscaping, and sidewalks are either not present or damaged
☐ b. There is landscaping and the sidewalks are present and in good repair (acceptable to the community)
☐ c. The landscaping and other facilities are attractive and well maintained (it is a center of pride for the community

24. What color are the walls in a majority of the instructional spaces?

☐ a. Dark colors
☐ b. Pastel colors
☐ c. White or off-white colors

25. Is the facility located near a busy, major high-way, frequently used rail line, an area where aircraft frequently pass overhead, or any other loud noise producing environment?

☐ a. Yes, and no measures have been taken to reduce the noise level within the facility
☐ b. Yes, but measures have been taken to reduce the level of noise within the facility
☐ c. No

26. Do classrooms have connections to a school-wide local area computer network?

☐ No
☐ Yes

27. Do classrooms have connections to a district-wide or other wide area computer network?

☐ No
☐ Yes

28. Do classrooms have internet access?

☐ No
☐ Yes

29. Do classrooms have cable connections to a central television antenna or other cable television system?

☐ No
☐ Yes

30. What do you consider the condition of your facility cosmetically and structurally?

☐ a. Below standard
☐ b. Standard
☐ c. Above Standard

31. What is the approximate gross square footage of the facility? (Use buildings' rough dimensions)

32. What is the approximate acreage of the school site?

33. Please include any additional comments you would like to make about your building in the space below.

VITA

Calvin C. Bullock
6401 Olde Bullocks Circle
Suffolk, Virginia 24535
Home: (757) 483-5985
Office: (757) 242-3229

Education

Defense of Doctoral Dissertation, Summer 2007
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Master of Science, 1995
Education
Old Dominion University
Norfolk, Virginia

Master of Public Administration, 1993
Troy State University
Troy, Alabama

Bachelor of Science, 1986
Education
Southern Illinois University
Carbondale, Illinois

Employment

Principal
Windsor Middle School
Isle of Wight County Public Schools
Smithfield, Virginia

Assistant Principal
Smithfield Middle School
Isle of Wight County Public Schools
Smithfield, Virginia

Teacher
Smithfield Middle School
Isle of Wight County Public Schools
Smithfield, Virginia