A Study of the Relationship between Building Conditions and Student Academic Achievement in Pennsylvania's High School

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ABSTRACT

This study investigated the relationship between school building conditions and student academic achievement in Pennsylvania's high schools. Research questions analyzed by step-wise multiple regression were: (a) Is there a relationship between overall school building conditions and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?; (b) Is there a relationship between the cosmetic conditions of school facilities and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?; and (c) Is there a relationship between the structural conditions of school facilities and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?

Two hundred and five randomly selected high schools in the Commonwealth of Pennsylvania were identified as the population for this study. Selected high school principals or principal designees were sent an on-line version of a modified Commonwealth Assessment of Physical Environment (CAPE) survey to ascertain information regarding the building conditions of their respective high schools. Student academic achievement data was measured by a three year scale score average of students' performance on the writing, reading and mathematics sections of the Pennsylvania System of School Assessment (PSSA) exams. Socio-economic status (SES) was identified as the

percentage of students eligible for free or reduced lunch. This factor was used as a covariant to control academic achievement variance related to SES.

A step-wise regression analysis identified that a relationship exists between high school building conditions and student academic achievement in Pennsylvania's high schools. As the building conditions in the participant high schools surveyed improved, a corresponding increase in the academic achievement of its students was noted. It did not appear to matter if the improvement in a school buildings condition was cosmetic or structural; any improvement in a school buildings condition was associated with an increase in student academic achievement. This would seem to indicate that a relationship exists between student academic achievement and school building conditions in Pennsylvania high schools.

DEDICATION

This dissertation is dedicated to my family who supported and encouraged me throughout the past four years. To my mother, who was always there to listen and offer advice and words of encouragement. To my father and best friend, who has helped direct me through this maze and has served as my sounding board, I couldn't have done it without your guidance and support. To my children, Delaney, Liam and Kian, who I am thankful for their love and support, Daddy is finally done! But most importantly, I dedicate this to my wife Amy. Without her support, patience, understanding and love I would have never made it though this process. Thank you and I love you.

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CHAPTER 1: Context of Inquiry

One of the expectations associated with education in the United States is that all students should be provided an opportunity to maximize their intellectual potential. This expectation requires educators to constantly focus on factors which promote academic achievement. In 2002, President George W. Bush signed into law the No Child Left Behind (NCLB) legislation. This legislation is based on such principles as a stronger accountability for student results, the measurement of academic progress through assessment and the need for increased student academic achievement (U.S. Department of Education, 2005). As a result of this legislation, school systems throughout the United States are required to meet their responsibility to provide a high-quality education for all students and are being held more accountable for the academic success of their students (U.S. Department of Education, 2005). In the context of this renewed focus on student achievement it is imperative that all factors which may contribute to the academic success of students be thoroughly examined. One such factor, the physical condition of the school building, must be examined to determine its impact on student academic achievement.

In 1998, the American Society of Civil Engineers indicated that our schools are in worse shape than any other infrastructure in America. In fact, they stated "that one third of all schools need extensive repair or replacement" and gave the condition of American schools an overall grade of "F". A General Accounting Office (GAO) report (U.S. General Accounting Office, 2000) cited that 2,400 new public schools will be needed to accommodate an expected rise in enrollment. Already the nation has invested billions of dollars (U.S. General Accounting Office, 1995) in school infrastructures to create an environment where children can be properly educated and prepared for the future.

However, as school buildings grow older, and the physical conditions of these buildings begin deteriorating, and educational instruction continues to change, this might not be enough.

In the General Accounting Office's 2000 study, they concluded that the average age of a public school building in the United States is forty-two years. Honeyman and Sayles (1995) stated that thirty percent of all school buildings in the United States are approaching the end of their useful life at fifty years. According to their study, that identifies the various phases in a school buildings life:

> "When a school is twenty to thirty years old, frequent replacement of equipment is needed. Between thirty and forty years old, the original equipment should be replaced, including the roof and electrical equipment. After forty years, a school building begins a rapid deterioration and the building is rendered functionally obsolete and after sixty years most schools have exceeded its useful life and must be completely renovated or abandoned." (p.2)

Al-Enezi (2002) states, "One acquires an education in order to ensure a smooth and flexible transition to an independent and self-sufficient life. In order to facilitate delivering a good education to learners, schools need to be conducive to learning because a high quality education might not be as accessible in an unfavorable environment such as a poorly maintained building." (p.1)

Studies conducted by Cash (1993), Hines (1996) and Lanham (1999) have found there is a relationship between the physical and environmental conditions of a school building, student achievement and student behavior. Chan (1980) identified a positive relationship between the physical environment and the academic achievement of middle

school students in Georgia. Edwards (1991), in her study of the District of Columbia public schools, established that student achievement can be influenced by the school environment and conditions. Research studies conducted by Cash (1993), Hines (1996), Lanham (1999) and Al-Enezi (2002) have investigated the relationship between school buildings conditions and student achievement in Virginia's high schools (Cash and Hines), Virginia's elementary schools (Lanham) as well as the Kuwaiti school system (Al-Enezi) and identified these factors as being related to each other. Many schools throughout the Commonwealth of Pennsylvania are in need of repair or renovations.

It has long been understood that the condition of a school facility sends a message to those who attend that school. The failure to properly maintain an educational facility sends a message that no one cares about what is going on inside the building. A school building that is kept clean and in good condition sends a message to the students, faculty and community that those attending the school are cared for and what happens inside the building is important.

Purpose of Study

The purpose of this study was to examine the relationship between student academic achievement and the overall building conditions; cosmetic building conditions and structural building conditions of high schools operating in the Commonwealth of Pennsylvania during the 2004-2005 school year.

Research Questions

This study examined whether a relationship exists between student academic achievement and the cosmetic and structural conditions in Pennsylvania's high schools. The study was designed to provide answers to the following questions:

1. Is there a relationship between overall school building conditions and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?
2. Is there a relationship between the cosmetic conditions of school facilities and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?
3. Is there a relationship between the structural conditions of school facilities and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?

Operational Definitions

High Schools

It is understood that there are various grade level combinations including 7-12; 8-12; 9-12 or 10-12 that are employed by high schools throughout the Commonwealth of Pennsylvania. However, for the purpose of this study a high school was defined as those schools that include an 11th grade and house grades 9-12 and/or grades 10-12.

Student Achievement

Student achievement was defined as student academic achievement on the math, writing and reading parts of the Pennsylvania System of School Assessment (PSSA). The

measure of actual student achievement was obtained from the above proficient, proficient, basic and below basic percentile rank of eleventh grade students who participated in the previously mentioned PSSA exams during the 2002-2003; 2003-2004 and 2004-2005 school years.

School Building Conditions

School building conditions were defined as the rating on the Commonwealth Assessment of Physical Environment (CAPE) for the overall, structural and cosmetic conditions of a building. This instrument identifies structural building conditions as building age, temporary classrooms, building renovation/addition, type of flooring, windows, air-conditioning, heating, roof leaks, classrooms lighting, classroom structural characteristics, structural condition of the building, facilities adjacent to the building, exterior noise, classroom electrical outlets and ceiling covering. Cosmetic building conditions were identified as interior paint, exterior paint, graffiti locations, graffiti removal, classroom furniture, overall cosmetic rating and floor cleaning frequency. Overall building conditions were identified through a rating of all the physical features of the school building by the building principal or administrator in charge of facilities.

Socio-Economic Status (SES)

Socio-Economic status was defined as the percentage of students eligible for free or reduced lunch compared to the number of students enrolled in the high school during the 2004-2005 school year. This factor was used as a covariant to control academic achievement variance related to SES.

Significance of Study

America's public schools are at a critical state. A 2000 study from the General Accounting Office found that the average public school building is forty-two years old. By this age most buildings have probably gone through a major renovation where all the original equipment has been replaced. Even if renovations have occurred, many of these buildings are still deteriorating because of their age as well as by the demands placed on them by educational programs that were never contemplated when the buildings were constructed. Today, education is delivered in an entirely new manner with new tools, techniques and teaching methods that increasingly do not fit the school designs of forty-two year old buildings.

Various studies have demonstrated a relationship between building conditions and student achievement in high school; middle school and elementary schools across the nation. The enactment of the No Child Left Behind legislation with its focus on accountability and increased academic achievement heightens the responsibility for all involved parties to examine ways to achieve these goals. In a time of increased academic expectations it is imperative that we thoroughly investigate all factors that influence student achievement**.**

This study can be used to provide educational leaders, politicians and community members with documentation regarding the impact that building conditions have on high school student's achievement. This documentation can then be used to bolster a school district's development of an overall plan concerning the importance of appropriating funds necessary for present and future repair or renovation projects. If the physical condition of a school facility appears to have a significant influence on student academic achievement,

recommendations would be made for adapting the physical environment in a way that positively influences student achievement.

Theoretical Model

Throughout the years there has been considerable interest and research conducted regarding the relationship between building conditions and student achievement. One of the first studies of the modern era to analyze this relationship was a doctoral study conducted by Tak Cheung Chan. In his research Chan (1980) studied eighth graders in public schools across Georgia. Data were generated by the student's scores on the Iowa Test of Basic Skills (ITBS) as well as a from a building conditions survey completed by the school principal. Chan's results concluded that there is a positive correlation between good building conditions and academic achievement of students. He found that after controlling for socioeconomic status, students in air conditioned buildings showed improved scores in vocabulary over students in non- air conditioned buildings. No significant differences were observed in students reading, language, word study and mathematics sections of the test. However, he concluded that building conditions, particularly air conditioning, played a statistically significant role in the academic achievement of students in this study.

Subsequent studies conducted by Edwards (1991), Cash (1993), Hines (1996), Lemasters(1997), Lanham (1999), O'Neill (2000) and Al-Enezi (2002) have all investigated this relationship and have concluded that there is a relationship between building conditions and student achievement. According to Chan (1996) an increase in research studies dealing with educational facilities is attributed to a rise in the number of questions regarding the impact of teaching and learning on student achievement and the

obsolete conditions of school buildings. Students are more likely to be successful in an environment that is conducive to learning. The condition of the school building influences the perceptions of both school staff and parents, who in turn influence the behavior and achievement of the students. A good learning environment frees students from physical distress, making it easier for students to concentrate on school work. The condition of a building also directly influences the achievement and behavior of students. (Earthman, Cash & VanBerkum, 1996)

Studies by Edwards (1991), Cash (1993), Hines (1996), Lemasters(1997), Lanham (1999), O'Neill (2000) and Al-Enezi(2002) show that the condition of buildings where students spend the majority of their time does impact on their achievement level. Research has indicated that buildings in poor condition are unable to effectively support the educational programs and generally do not have those elements directly relating to student achievement which are found in functional buildings (Earthman, 2004).

Cash (1993) developed a theoretical model (Figure 1) that illustrated how student achievement and behavior was affected by the condition of the school building. In her theoretical model, Cash indicates that the condition of a school building is influenced by leadership, financial ability, custodial staff and maintenance. These factors in turn directly influence student achievement and behavior. In addition, the model shows that school building conditions have an influence on the attitudes of parents, students and faculty. Consequently, the attitudes of parents and faculty appear to have a direct influence over the opinion students have toward their school building. As a result, building conditions which

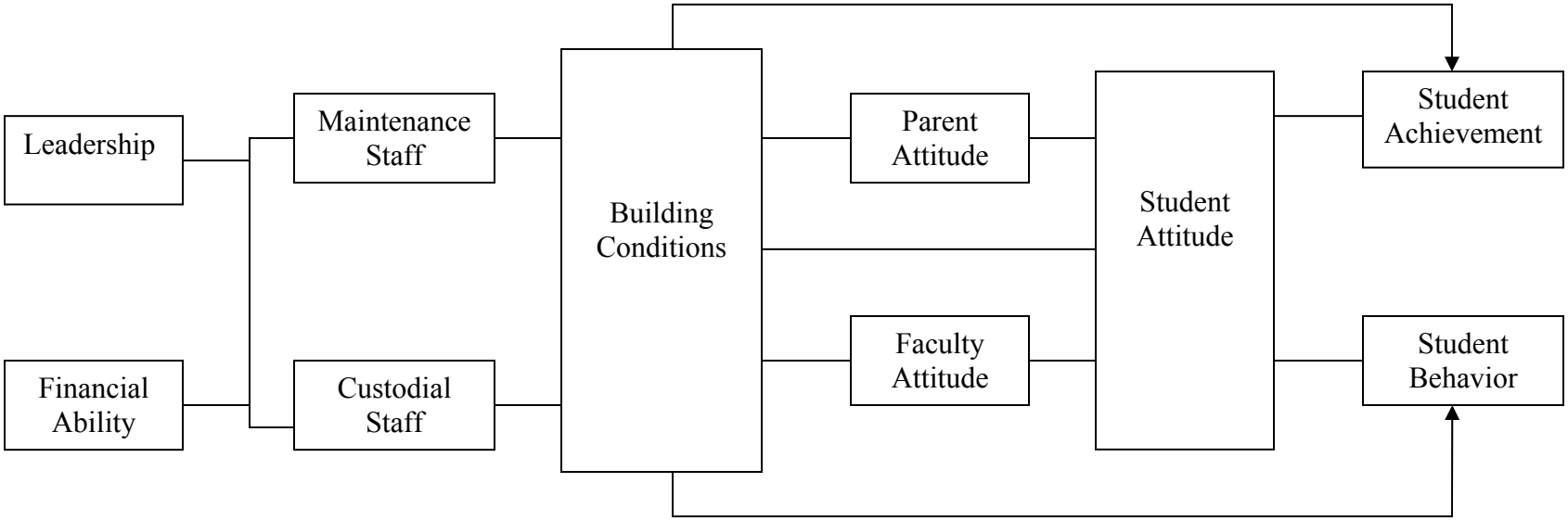

Figure 1. Cash's model: The direct relationship between building conditions and student achievement. From: "Building Conditions and Student Achievement and Behavior," by Carol Cash (1993) Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University.

are strongly influenced by leadership and financial ability have an impact on student achievement and behavior. Hines (1996) utilized Cash's theoretical model in a study of Virginia's urban high schools.

Subsequent studies by Lemasters (1997) and Lanham (1999) modified Cash's model. Lemasters model (Figure 2) was based on her meta-analysis of research studies conducted from 1980 to 1996 on building conditions and student achievement. This model incorporated the results of both the Cash and Hines study. She recommended modifications to the previous studies in order to separate building conditions into cosmetic conditions and structural conditions.

Lanham's model (Figure 3) further developed the Cash and Lemasters models into elementary schools. Lanham identified the direct or indirect influences of building conditions on the achievement level of elementary school students in these buildings. He stated that indirect influences occur when the building conditions influence the attitudes and behaviors of the parents, the community, the faculty, the staff and finally the students. Lanham identified antecedents to building conditions such as deferred maintenance, funding priorities and administrative decisions as playing a significant role in influencing building and classroom conditions. As a result of these factors, student achievement might be directly or indirectly influenced by building and classroom conditions.

In studying the influence of building conditions on student achievement in Kuwait, Al-Enezi (2002) combined Cash's (1993), Lemasters' (1997) and Lanham's (1999)

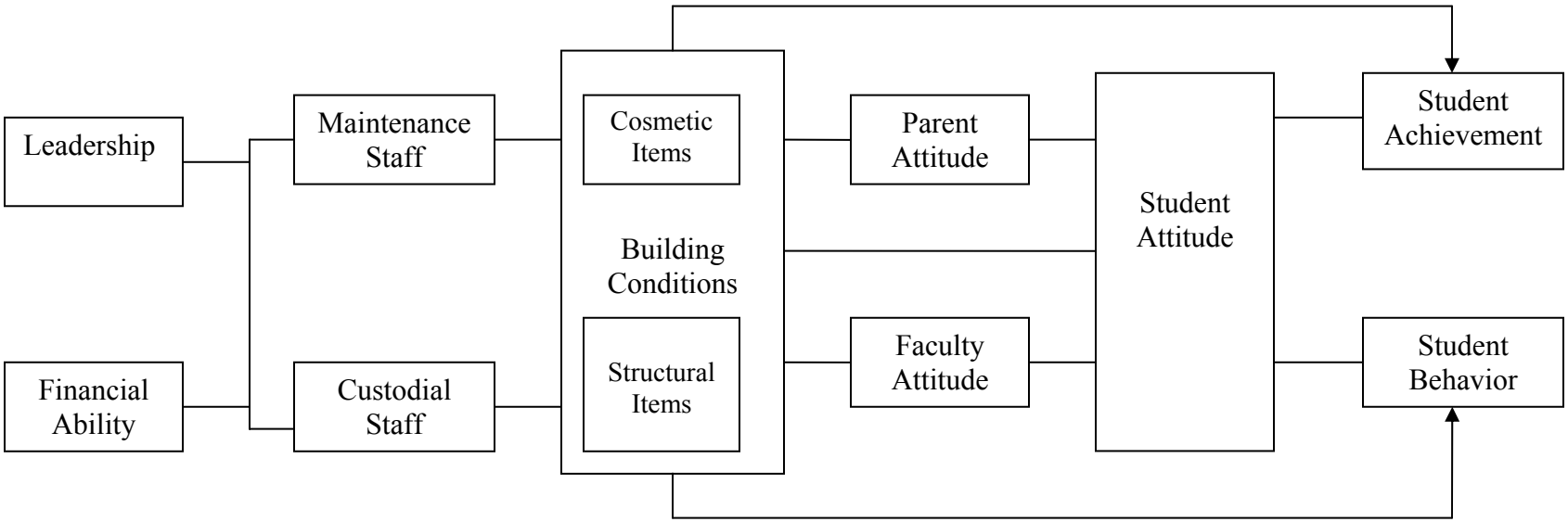

Figure 2. Lemasters model: Cash's model that accounts for cosmetic conditions and structural conditions of a building. From: "A synthesis of studies pertaining to facilities, student achievement, and student behavior," by Linda Lemasters (1997). Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University.

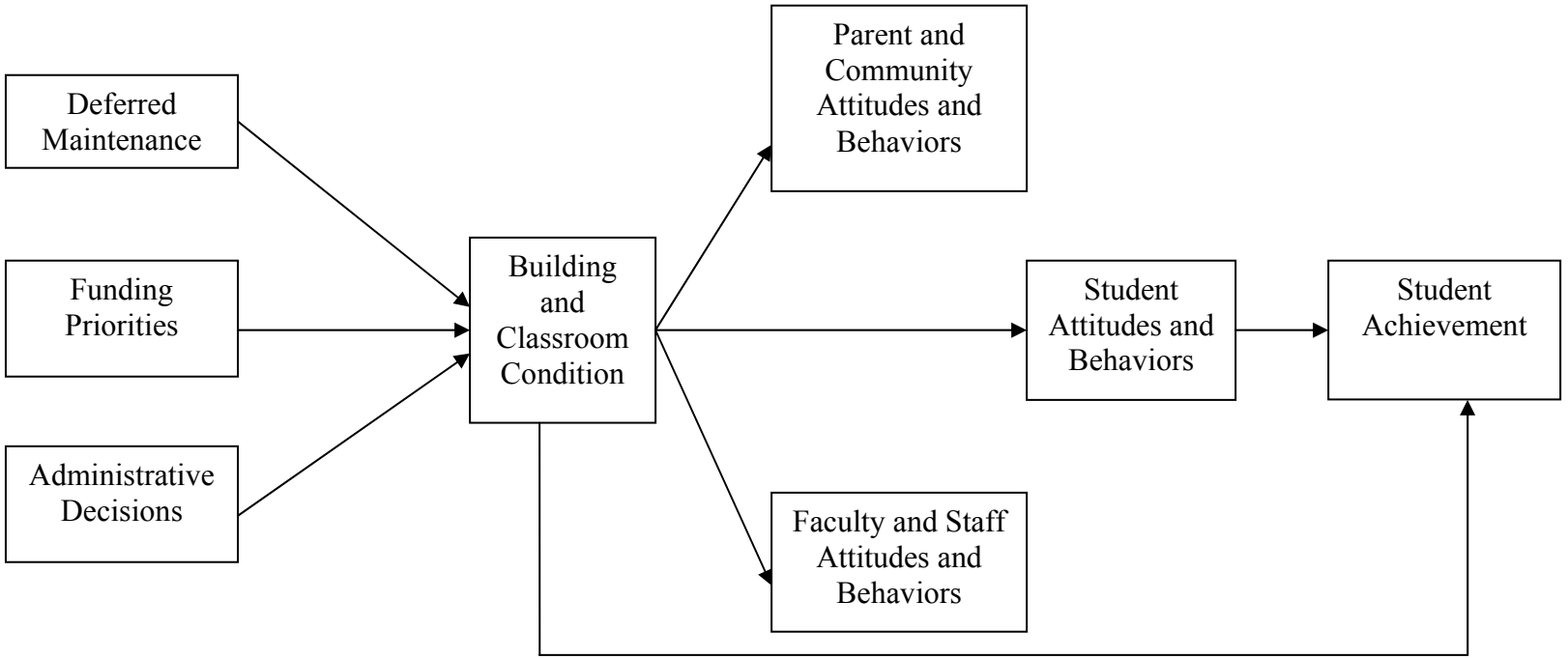

Figure 3. Lanham's model: From: "Relating building conditions to student achievement in Virginia's elementary schools," by James Lanham (1999). Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University.

models. In order to reflect the cultural distinction of this study Al-Enezi (Figure 4) identified six different antecedents that contribute to the excellence of school building conditions. These factors are administrators' perceptions, maintenance and custodial staff, government policies and decisions, levels of administration within the government and funding decisions. He believed administrators' perceptions, funding priorities and deferred maintenance indirectly influences student achievement. Al-Enezi used Cash's explanations of parent attitude, faculty attitude, student attitude, student achievement and student behavior, to identify the relationship between building conditions and student achievement.

The theoretical model utilized for this study (Figure 5) will be a modified version of the one developed by Al-Enezi (2002). Since Al-Enezi theoretical model was designed specifically for Kuwait, the antecedents of the Kuwaiti Ministry of Education Funding Decisions and the Kuwaiti Ministry of Education Administration/Leadership were omitted because they did not reflect the needs of high schools in the Commonwealth of Pennsylvania.

Organization of Study

This paper is organized in the following manner. Chapter 1 provides the context of inquiry, purpose of the study and the significance of the study. It also includes the operational definitions, the organization of the study and theoretical models. Chapter 2 reviews and analyzes the literature discussing the relationship between building conditions and student achievement. Chapter 3 provides a description of the methodology, research design, setting, populations, the sample for the study, method of data collection and statistical analysis used in the study. Chapter 4 provides a descriptive analysis of the high school principals or principal designee responses to the Commonwealth Assessment of

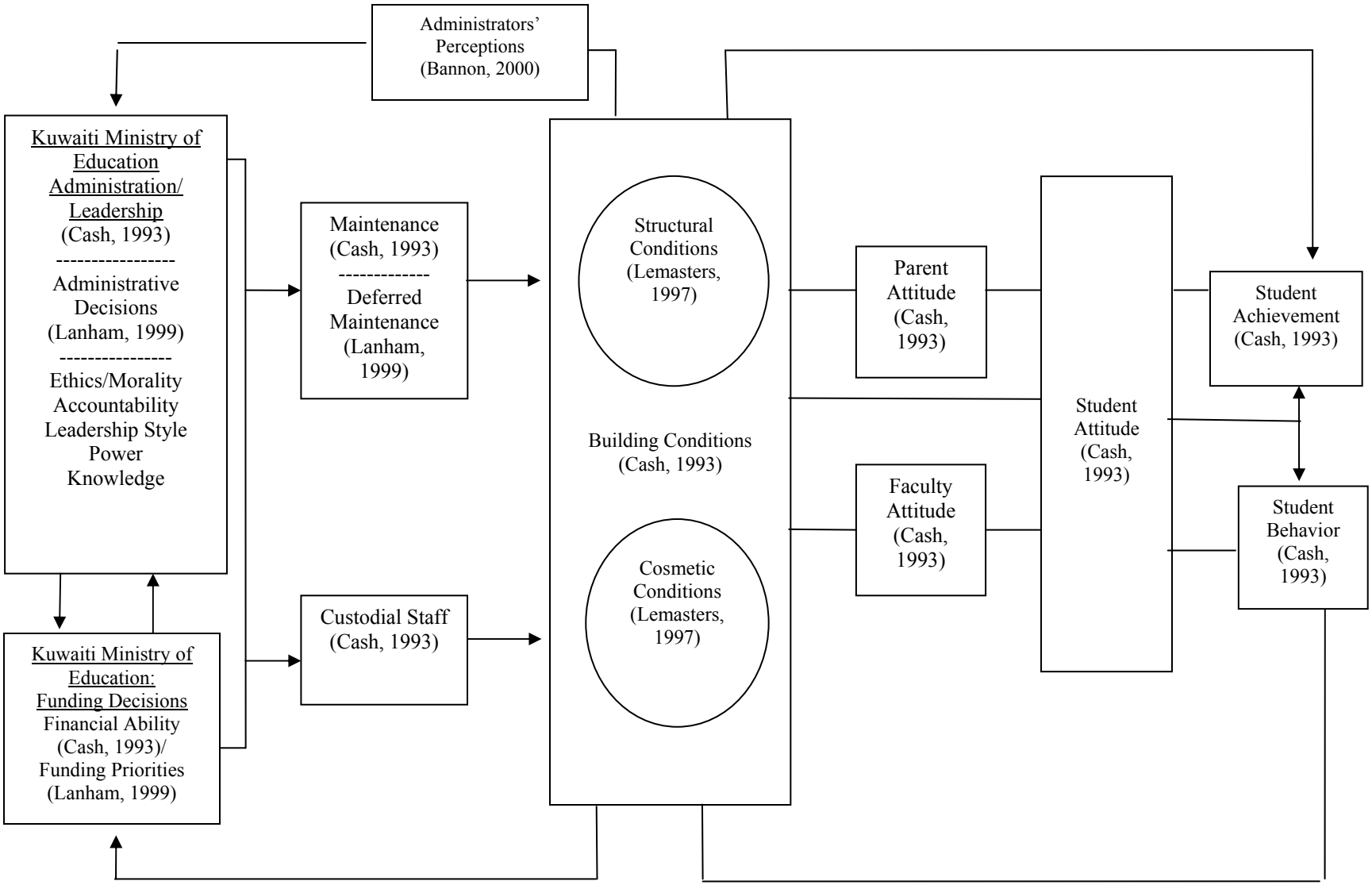

Figure 4. Al-Enezi Theoretical Model: Modified from "Relating building and classroom conditions to student achievement in Virginia's elementary schools' (Lanham, 1999); "A synthesis of studies pertaining to facilities, student achievement, and student behavior" (Lemasters, 1997); and "Building Conditions and Student Achievement and Behavior" (Cash, 1993).

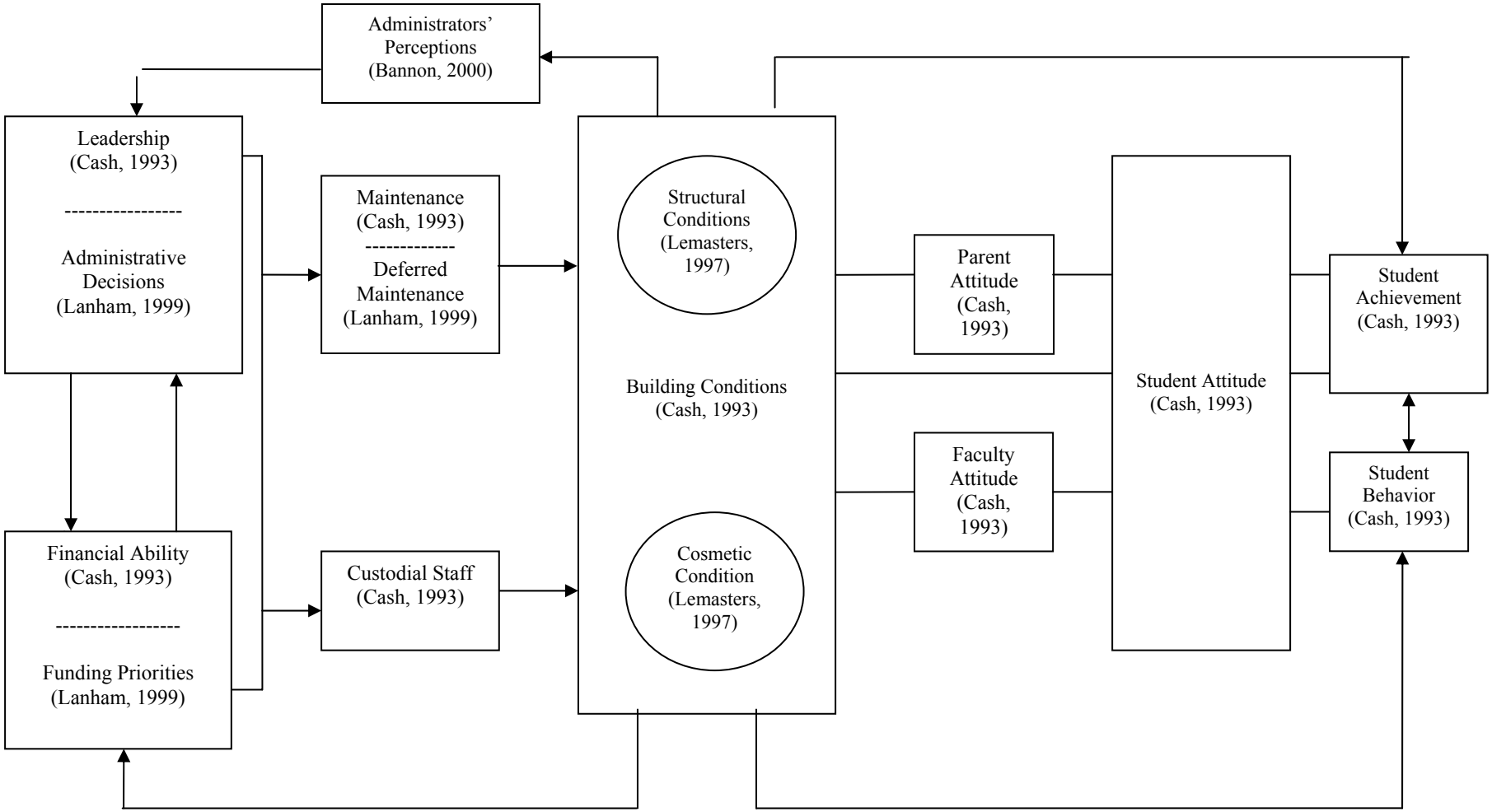

Figure 5. Al-Enezi model modified for Pennsylvania's high schools. Modified from "The study of the relationship between school building conditions and academic achievement of twelfth grade students in Kuwaiti public high schools."

Physical Environment (CAPE) and an analysis of the data. Chapter 5 provides a summary of the findings, conclusions, implications, discuss of the impact of the results on educational practices and recommendations for further study.

Chapter 2: Review of Related Literature

Chapter two examines the literature related to the influence that building and classroom conditions have on student academic achievement. This review shows the significant effect that building conditions have on student academic achievement. The research studies that were selected have examined the relationship between student academic achievement and building conditions since the 1980's. This review looks at studies conducted, at the elementary, middle, high school and international level, on the relationship between student academic achievement and overall building conditions.

Physical Environmental School Conditions

For many years there has been considerable interest and research regarding the relationship between building conditions and student achievement. One of the first studies to analyze this relationship was a 1980 doctoral study conducted by Tak Cheung Chan. In his research Chan (1980) studied eighth graders in 191 public schools across Georgia. Academic achievement data were measured by the student's scores on the 1975-1976 Iowa Test of Basic Skills (ITBS). Data regarding building conditions were obtained through a survey completed by the school principal.

Chan's results concluded that there is a positive correlation between building conditions and the academic achievement of students. He found that after controlling for socioeconomic status, students in air conditioned buildings showed improved scores in the Iowa Test of Basic Skills (ITBS) vocabulary section over students in non- air conditioned buildings. No significant differences were observed in student scores on the reading, language, work study and mathematics sections of the test. Consequently, he concluded

that building conditions, particularly air conditioning, played a statistically significant role in the academic achievement of students in this study.

J.H. Bowers and C.W. Burkett (1987) investigated school building conditions and student achievement to see if a relationship existed between student achievement and performance and school building conditions in two rural elementary schools in Tennessee. One of the schools selected was a new building, completed for the opening of the 1983-1984 school years. The other school was an older building, completed in 1939 and later renovated and extended in 1950. Both elementary schools served students from grades kindergarten through eight.

The student population of the newer school was 758 students during the 1983-1984 school year. It was noted that the newer school was equipped with modern amenities such as air conditioning systems, fluorescent lighting and electric heating. The newer school also had a uniform color schemes and acoustical controls that merged with the physical environment as well as newer classroom and teacher furniture. The older building housed 584 students for the 1983-1984 school year. This building had outdated furniture, air conditioning systems that worked infrequently, poorly coordinated color schemes and an outdated acoustical system.

Bowers and Burkett (1987) randomly selected 280 fourth and sixth grade students for their study. They did not attempt to control for socioeconomic status, since both schools served similar populations. Bowers and Burkett analyzed the data using Analysis of Variance (ANOVA), t-tests and chi-square. Students in modern buildings scored noticeably higher in listening, reading, language and arithmetic than did the students in older buildings. The results of this study indicate that, except for math, the academic

achievement of those students attending the newer building was significantly higher than that of students attending the older building.

Although Bowers and Burkett (1987) found a relationship between building conditions and student achievement the results of the study should be interpreted cautiously. Their sample population consisted of only two schools that were located within the same district/region. Utilizing a larger sample size and including a greater number of schools from around the state might have produced a more definitive result regarding the factors that effect student achievement.

The relationship between the condition of public school buildings in Washington D.C. and student achievement and parental involvement was studied by Edwards (1991). She looked at the deteriorating conditions of Washington D.C.'s public schools and hypothesized that parental involvement and student achievement were affected by the condition of the buildings.

In order to examine this relationship a multiple regression analysis was conducted. School building conditions were identified by a survey conducted by the District of Columbia's Committee on Public Education (COPE). Buildings were given a rating of poor, fair or excellent. Based on this rating and the student achievement data, as measured by the Comprehensive Test of Basic Skills (CTBS), it was concluded that students housed in poor facilities scored lower than those student housed in excellent facilities. It was noted that schools in poor school buildings scored 5.45% points lower than students in fair school buildings and 10.9% points lower than students in excellent school buildings. These findings concluded that a proper learning environment along with an involved school and community were factors in students academic performance (Edwards, 1991).

Edwards recognized that the results of her study were somewhat limited because the information regarding parental involvement was dependent upon how the PTA was organized, the experience and quality of its officers and how cooperative the school administration was in working with the PTA.

Phillips (1997) examined the relationship of building age to the academic achievement and attendance of upper elementary students in both new and old buildings in rural Georgia. He identified three cohorts of 150 third, fourth and fifth grade students and evaluated their academic achievement on the reading and mathematics sections of the Iowa Test of Basic Skills (ITBS) during the 1993-1994 and 1995-1996 school years.

Phillips criteria for inclusion in his study were that students in the respective cohorts must have attended the same school for their third, fourth and fifth grade year. Cohort One, the control group, was comprised of students housed in an older facility throughout their third, fourth and fifth grade year. Cohort Two and Cohort Three, the two test groups, attended older schools, but within the evaluation window were moved to newer buildings. Cohort Two students attended the older building during third and fourth grades and moved to the newer building for fifth grade. Cohort Three students attended the older building for third grade and then were transferred to the newer building for fourth and fifth grade. The buildings the housed Cohort Two and Cohort Three were similar in design and replicated the entire school program in its move from the older building to the newer one. For the duration of this study all schools had the same principal and the instructional staff was relatively stable (Phillips, 1997).

Table 1

A Comparison of the Iowa Test of Basic Skills (ITBS) Mean Scores on Reading and Mathematics among Third, Fourth and Fifth Grade Students at Three different Elementary Schools

Subject		*Third Grade*	*Fourth Grade*	*Fifth Grade*
Reading	Cohort One	Older School ***	Older School 44.49	Older School 43.78
	Cohort Two	Older School 39.99	Older School 43.53	Newer School 46.33
	Cohort Three	Older School 43.24	Newer School 45.10	Newer School ***
Math	Cohort One	Older School ***	Older School 47.67	Older School 43.83
	Cohort Two	Older School 43.85	Older School 43.87	Newer School 51.50
	Cohort Three	Older School 49.55	Newer School 53.93	Newer School ***

Note: "Educational facility age and achievement and attendance of upper elementary school students" by R. Phillips (1997) Unpublished doctoral dissertation, University of Georgia.

*** No data reported

Phillips identified five hypotheses. Two hypotheses examined if students' ITBS scores in reading and mathematics were higher in newer school facilities than in older facilities. Three hypotheses tested the relationship between student attendance and academic achievement of upper elementary students and their ITBS scores on the reading and mathematics exam. Analysis of covariance (ANCOVA) tested these relationships by analyzing the results from Cohort One with the results from Cohort Two and Cohort Three.

The reading and math scores for the fifth grade students attending newer buildings, Cohort Two, were significantly higher than the students in Cohort One who attended older buildings. Additionally, the reading and mathematics scores of the Cohort Three fourth grade students who attended newer facilities were higher than those of the Cohort Two students who attended older facilities. These data are reported in Table 1. Phillips (1997) concluded that moving students to newer school buildings had a positive effect of student achievement and attendance.

School Facilities and Teacher Performance

Another study, Overbaugh (1990), examined how school facilities influenced the professional performance of teachers honored by the Council of Chief State School Officers as State Teachers of the Year. Initially, 53 elementary and secondary school teachers from various geographic regions and discipline areas were asked to participate. Of the forty-six teachers who agreed to participate and were mailed the survey instrument, 38 teachers responded. This survey instrument was developed to identify those aspects of the physical environment that have an impact on a teacher's ability to function properly. The survey solicited teacher responses relating to factors they viewed as most important. It also asked if they viewed these factors negatively or positively.

The responders included 22 secondary teachers and 16 elementary teachers. Thirteen of the fifteen males responding taught in secondary school and two in elementary school. Of the 23 females responding, 9 taught in secondary school and 14 in elementary school. The teaching experience of those responding ranged from 5 to 41 years, with the average teaching experience being 15 years. The number of buildings in which each respondent had worked ranged from 1 to 11, with 2 being the average. Twenty-seven of the respondents taught in traditional classroom setting**,** six taught in laboratory settings while the remaining five taught in open space classrooms.

Overbaugh utilized descriptive procedures in this research study. A Chi-square test and cross tabulation of independence was used to test for any differences in frequency distribution. She examined the data by gender, teaching level and experience, and found that teaching level and gender created the most significant variation. She concluded that overall the participants were satisfied with the influence facilities had on professional performance but they did have some concerns.

The responding teachers were aggravated by space utilization and by many non-instructional areas which consequently received the lowest ratings. Respondents identified classroom furnishings, space utilization, class size, thermal conditions, acoustics, well designed and well equipped computer labs and ambient features as the factors that influence their professional behavior and are essential in the design of a school.

Research Studies

Building Conditions and High Schools

Cash (1993) examined the relationship between the conditions of school buildings and student achievement and behavior in small, rural high schools in the Commonwealth of Virginia. The population for her study was small rural high schools not found in Virginia's eight Metropolitan Statistical Areas (MSA). These schools had a senior class of 100 students or less and were located outside urban areas. A sample of 47 schools were identified and used in this study.

Data on the conditions of the school facilities were gathered from the Commonwealth Assessment of Physical Environment (CAPE), which the researcher created. Cash developed this instrument by reviewing numerous instruments that assess school facilities and identifying factors that influence student academic achievement. The CAPE was designed as a building evaluation instrument to assist school personnel in more accurately determining the overall condition and classification of their building. The data gathered on the various school building conditions were rated as sub-standard, standard and above-standard in this evaluation. Survey categories discussed in the CAPE included items regarding air conditioning, thermal conditions, lighting, interior and exterior painting, color and the presence of graffiti. The survey consisted of sixteen questions which rated structural building conditions and ten questions which rated cosmetic building conditions. Ultimately, a structural, a cosmetic and an overall building condition rating was determined by the presence or absence of factors addressed in the survey instrument**.**

Forty-seven principals were sent surveys and forty-three schools responded, finding a ninety-one percent return rate. Student achievement data were gathered from the

individual schools and identified by the eleventh grade scaled scores on the Test of Academic Proficiency (TAP) for the 1991-1992 school year. All achievement scores were adjusted of socioeconomic status by using the percentage of students in the free and reduced lunch program. Cash used the average school scaled scores on the reading comprehension, mathematics, written expression, information, basic composition, social studies and science subtests to compare student success among schools.

Cash analyzed the data using analysis of covariance, regression and correlation analysis. An analysis of covariance was used to compare the adjusted score means of schools with different building assessment ratings, while regression analysis was used to compare achievement score means to behavior rating means and achievement score means to building age. A Pearson's correlations analysis was conducted to analyze if a relationship existed, in the results already adjusted for socioeconomic status, between economic conditions and student achievement.

In order to generate an overall building condition rating, scores from the CAPE were used. Based upon the CAPE score each school was assigned an overall building condition rating of sub-standard, standard or above-standard. The mean academic achievement scores of students were then compared with the overall building condition rating. Table 2 shows the results of this comparison. It was concluded that writing scores were lower in sub-standard building conditions than they were in above-standard building conditions. In all instances, it was found that buildings which were rated above standard

Table 2

A Comparison of Structural Building Conditions, Cosmetic Building Conditions and Overall Building Conditions and the Percentile Ranks on Subtests of the Test of Academic Proficiency (TAP) for Grade 11 during the 1991-92 school year

	Structural Building Conditions			Cosmetic Building Conditions			Overall Building Conditions		
	Sub-Standard	Above Standard		Sub-Standard	Above Standard		Sub-Standard	Above Standard	
Achievement	*% tile*	*% tile*	*Difference*	*% tile*	*% tile*	*Difference*	*% tile*	*% tile*	*Difference*
Reading Comp.	**49**	**47**	**2**	47	50	3	47	51	4
Mathematics	45	45	*0	43	47	4	43	47	4
Written Expression	55	56	1	54	56	2	57	59	2
Sources	50	50	*0	49	51	2	48	52	4
Basic Composite	**50**	**49**	**1**	49	50	1	49	53	4
Social Studies	**50**	**48**	**2**	50	48	2	48	51	3
Science	**55**	**53**	**2**	52	55	3	50	55	5
Complete Composite	**50**	**49**	**1**	47	50	3	47	52	5

Note: From "Building Conditions and Student Achievement and Behavior" (p. 46-51) by Carol Cash (1993) Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University.

Bold- percentile ranks in sub-standard buildings are higher than above standard; * No difference between percentile ranks of sub-standard and above standard building conditions.

had the highest achievement scores. The greatest difference in achievement scores was seen in the area of science where the average scores of students in sub-standard buildings conditions was 50% while the average scores of students in above-standard buildings conditions was 55%.

These achievement scores were then used to examine the relationship between structural and cosmetic building conditions in the 21 schools identified as above-standard against the 20 schools rated as sub-standard. These results are presented in Table 3. The results for cosmetic building conditions revealed that students in above-standard buildings scored one to four points higher than students in sub-standard buildings. The area of social studies was the only exception, where it was found that students in sub-standard buildings scored higher than students in above-standard buildings. It was also found that when examining structural building conditions, students in above-standard buildings scored lower than students in sub-standard building conditions on five of eight sub-tests: Reading, Basic Composite, Social Studies, Science and Complete Composite. These findings can be found in Table 3. Cash's findings indicated that student academic performance was positively related to building conditions. Cash concluded that student achievement was higher in schools with better building conditions.

Although the study offered evidence that building conditions influence student academic achievement, these results should be interpreted cautiously. Cash admitted that there was some confusion with specific questions used in collecting data, as well as poor record keeping and recording procedures. These concerns might have influenced the lack of clarity in examining the results. Also, having a lack of variance within a small sample size might have influenced the results. Including more samples in the study could have

influenced the predicted and expected results of building conditions and student achievement.

Earthman, Cash and Van Berkum (1996) conducted a state-wide study of North Dakota's high schools to investigate the possible relationship between selected student variables and school building conditions. They used Cash's methodology and model to examine the relationship between building conditions and student achievement in a larger market. North Dakota was selected because their students had achieved some of the highest scores on the Scholastic Achievement Test (SAT). In 1992, the math scores of North Dakota's eighth grade students were the third highest in an international comparison of scores and their population was relatively homogenous. One hundred ninety-nine high schools throughout North Dakota served as the population for this study.

Data were gathered on building conditions using a modified version of Cash's Commonwealth Assessment of Physical Environment (CAPE), called the State Assessment of Facilities in Education (SAFE). The SAFE was divided into three categories: the overall building condition, the structural building condition and the cosmetic building condition. One hundred ninety-nine high school principals were sent surveys and one hundred twenty responses were returned, finding a sixty percent return rate. Student achievement was measured by using eleventh grade student scores on the Comprehensive Test of Basic Skills (CTBS). Student's overall scale scores for each high school were used as the comparison indicator.

Earthman, Cash and Berkum (1996) conducted three studies involving overall, structural and cosmetic building conditions. The first study compared overall building conditions and student achievement with all sections of the CTBS. These results found that

students, in schools that were considered to have above-standard building conditions, scored one to nine percentile points higher on all but two sections on the CTBS. These findings are listed in Table 3. Student achievement scores on the Math Total were one percentage point higher in sub-standard buildings than those in above standard buildings. There was no difference between sub-standard and above-standard building in social studies.

In the second study, researchers compared cosmetic building conditions with student achievement. It was found that students in above-standard buildings scored one to eleven percentile points higher on all but one section of the CTBS than students in standard and above-standard building conditions. The only exception was found on the Language Mechanics section where there was no observable difference in academic achievement between schools with standard building conditions and above standard building conditions.

In the third study, researchers compared structural building conditions and student achievement and found the conclusions to be incompatible with the previous two studies. They found that students in above-standard buildings scored one to eight percentile points higher than students in standard buildings in 8 of 13 sections of the CTBS. However, they also found that students in sub-standard buildings scored between three and twelve percentile points higher than students in above-standard buildings on the Math Comprehension, Math Concept and Application, Math Total and Social Studies sections of the CTBS.

Earthman, Cash and Van Berkum(1996) concluded that a positive relationship existed between building conditions and student achievement with building age, air

Table 3

A Comparison of Structural Building Conditions, Cosmetic Building Conditions and Overall Building Conditions and Percentile Ranks on Subtests of the Comprehensive Test of Basic Skills (CTBS) for Grade 11 during the 1992-93 school year

	Structural Building Conditions			Cosmetic Building Conditions			Overall Building Conditions		
	Sub-Standard	Above Standard		Sub-Standard	Above Standard		Sub-Standard	Above Standard	
Achievement	*% tile*	*% tile*	*Difference*	*% tile*	*% tile*	*Difference*	*% tile*	*% tile*	*Difference*
Reading Voc.	46	51	5	51	58	7	48	55	7
Reading Comp.	49	49	*0	52	53	1	51	52	1
Reading Total	49	52	3	53	57	4	52	55	3
Spelling	47	49	2	47	58	11	49	58	9
Language Mech	48	56	8	59	59	*0	53	59	6
Language Exp	54	59	5	59	63	4	58	63	5
Language Total	54	59	5	59	63	4	59	63	5
Math Comp	**69**	**59**	**10**	62	70	8	66	67	1
Math Con& App	**68**	**65**	**3**	65	71	6	66	69	3
Math Total	**70**	**58**	**12**	64	71	7	**67**	**66**	**1**
Total Battery	57	58	1	59	66	7	58	63	5
Science	55	62	7	61	69	8	59	66	7
Social Studies	**65**	**60**	**5**	61	65	4	65	65	*0

Note: From: "Student Achievement and behavior and school building conditions" by G. Earthman, C. Cash and D. Van Berkum, (1995) Annual Meeting of the Council of Educational Facility Planners, International, Dallas, TX. **Bold**- percentile ranks in sub-standard buildings are higher than above standard. * No difference between percentile ranks of sub-standard and above standard building conditions.

conditioning and noise recognized as being the most identifiable characteristics. It was also observed that the relationship between the number of student's in buildings categorized as sub-standard who outscored students in buildings categorized as above-standard was not as strong as in Cash's study. They also observed that, as in Cash's initial study, behavioral incidents were higher in above-standard buildings however, no definitive explanation for this finding was given.

Hines (1996) replicated Cash's study in an analysis of urban high schools throughout the Commonwealth of Virginia. Building conditions were determined by results from a revised Commonwealth Assessment of Physical Environment (CAPE) which was administered to 88 urban schools. Student achievement data were identified by the eleventh grade scaled scores on the Test of Academic Proficiency (TAP) for the 1992-1993 school year. Achievement scores were adjusted for socioeconomic status by using the percentage of students in the free and reduced lunch program for each school. An analysis of covariance was utilized to compare the adjusted means of achievement scores with the three building ratings.

Hines (1996) found there was a positive relationship between building conditions and student achievement. Student achievement scores were higher in those schools with better building conditions. In analyzing overall building conditions, the scaled scores of students in above-standard schools were between 9 and 17 percentile points higher on all subtests than students in sub-standard schools. Comparable results, with one exception, were seen when examining the relationship between cosmetic building conditions and structural building conditions and student achievement. The exception was that students in sub-standard buildings achieved scores on the sources of information subtest that were the

same as or higher than those of students in above-standard buildings. Overall, the scaled scores of students in above-standard buildings were 8.45 percentile points higher than those of students in sub-standard buildings. Factors correlated with higher scores included building age, absence of graffiti and the quality of the heat and air conditioning systems. The data associated with the Hines (1996) study are provided in Table 4. The results of Hines' study, as with Cash's, should be viewed cautiously because of concerns regarding building classifications.

Building Conditions and Elementary Schools

The relationship between student achievement and building conditions in Virginia's elementary schools was investigated by Lanham (1999). Lanham modified Cash's (1993) model by including the variable deferred maintenance in building conditions which he believed would have a negative impact on building and classroom conditions. He conducted a random sample of 300 elementary schools in the Commonwealth of Virginia that housed both third and fifth grade students. To collect data regarding building and classroom conditions in Virginia's elementary schools, Lanham distributed a survey to elementary school principals that was based on the Commonwealth Assessment of Physical Environment (CAPE) developed by Cash (1993) and used by Earthman, et al (1996). However, he did not use the survey responses to categorize buildings as sub-standard, standard or above-standard. He added four items concerning technology that were also analyzed. Two hundred and ninety-nine principals were sent surveys and one-hundred and ninety-seven were returned, resulting in a sixty-seven percent return rate.

Table 4

A Comparison of Overall Building Conditions, Structural Building Conditions and Cosmetic Building Conditions with Percentile Ranks on Subtests of the Test of Academic Proficiency (TAP) for Grade 11 during the 1992-93 school year

	Structural Building Conditions			Cosmetic Building Conditions			Overall Building Conditions		
	Sub-Standard	Above Standard		Sub-Standard	Above Standard		Sub-Standard	Above Standard	
Achievement	*% tile*	*% tile*	*Difference*	*% tile*	*% tile*	*Difference*	*% tile*	*% tile*	*Difference*
Reading Comp.	54	62	8	54	59	5	48	63	15
Mathematics	56	65	9	58	62	4	49	66	17
Written Expression	61	66	5	61	65	4	58	67	9
Sources	**58**	**57**	**1**	58	58	*0	54	67	13
Basic Composite	58	65	7	58	63	5	52	65	13
Social Studies	59	66	7	59	63	4	54	65	11
Science	63	70	7	63	68	5	57	66	9
Complete Composite	57	66	9	57	63	6	52	66	14

Note: From: "Building Conditions and Student Achievement and Behavior" by E. Hines (1999) Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University. **Bold-** percentile ranks in sub-standard buildings are higher than above-standard. * No difference between percentile ranks of sub-standard and above standard building conditions.

Student achievement data were collected using the Standards of Learning (SOL) examination that was taken by third and fifth grade students in the spring of 1998. Scaled scores were obtained through the Virginia Department of Education. The scaled scores from the third grade English, fifth grade English, third grade mathematics, and fifth grade mathematics were used. Since scaled scores were not available for the fifth grade technology exam, the percentage of students passing the exam was used. Socioeconomic status was determined by using information on the percentage of students enrolled in the free and reduced lunch program.

Lanham analyzed the data using Pearson's product moment correlation matrix and a step-wise multiple regression analysis. The step-wise multiple regression analysis was used to determined the relationship between the identified dependent variable and two or more independent or predictor variables. Pearson's r was used to find the interrelationships between the various independent variables listed in the CAPE assessment.

In order to examine the influence that the independent or predictor variables had on the third grade English, fifth grade mathematics and fifth grade technology scores, Lanham had to account for the independent variables listed on the CAPE assessment. Lanham concluded that the variable free and reduced lunch, used as an indicator of poverty, appeared to have a greater influence on student achievement in English and technology than in mathematics. These findings are listed in Table 5. Lanham also cited inadequate air conditioning as having a significant impact on student achievement. Other variables that influenced student achievement were ceiling type, site size, floor sweeping

Table 5

A Comparison of the Step-Wise Multiple Regression for the Explanation of the Third and Fifth Grade English and Mathematics Standards of Learning (SOL) Assessment Scores and the Fifth Grade Technology Standards of Learning (SOL) Assessment Scores

Grade	*Subject*	*Step*	*Variable Entered*	*R*	R^2	*Increase in* R^2
Third Grade	English	1	Free and reduced lunch	.697	.486	
		2	Ceiling type	.719	.516	.030
		3	Air Conditioning	.729	.532	.016
		4	Site Size	.740	.548	.016
		5	Sweeping frequency	.751	.565	.017
	Math	1	Free and reduced lunch	.509	.259	
		2	Room structure	.545	.297	.038
		3	Mopping frequency	.567	.322	.025
Fifth Grade	English	1	Free and reduced lunch	.722	.522	
		2	Wide area network	.737	.543	.210
	Math	1	Free and reduced lunch	.397	.158	
		2	Air conditioning	.431	.186	.028
	Technology	1	Free and reduced lunch	.647	.419	
		2	Air conditioning	.683	.467	.048
		3	Ceiling type	.709	.503	.036
		4	Overall maintenance	.730	.532	.029
		5	Flooring	.740	.547	.015

Note: "Relating Building Conditions to Student Achievement in Virginia's Elementary Schools" by James Lanham (1999). Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University.

and mopping frequency, connection to a wide-area network, room structure, overall building maintenance and type of flooring.

Lanham's findings addressed the role that some independent variables, as part of a school buildings physical condition, play in influencing student achievement scores. Earlier studies were unable to determine the impact such variables might have on student achievement. Lanham found there was a relationship between building conditions and student academic achievement. However, if he identified building conditions as above-standard, standard or sub-standard and examined a possible correlation between student academic achievement and these building conditions, it would be easier to compare this study with previous research. Also, since student academic achievement scores were not adjusted for socioeconomic factors questions could be are raised about the generalization of these results. Addressing these concerns appropriately in future research should result in a more thorough investigation of this topic.

Building Conditions and Middle Schools

O'Neill's (2000) study investigated the impact of school facilities on student achievement, behavior, attendance and teacher turnover rates. It also identified environmental aspects of the school facility that had the potential to enhance learning. His study focused on Central Texas middle schools that were part of the Region XIII Educational Service Center. A total of 76 middle schools were selected to participate in this study.

Participating middle school principals were asked to complete a survey evaluating the architectural and cosmetic conditions of their buildings using the newly created Total Learning Environment Assessment (TLEA). Seventy-six principals were sent surveys and

seventy-three were returned, finding a ninety-six percent return rate. The TELA contained 82 items and used a Likert scale to evaluate the degree to which the school incorporates the identified feature. Data pertaining to student achievement on the Texas Assessment of Academic Skills (TAAS), student behavior, attendance, and teacher turnover was obtained from the Texas Education Agency's Division of Communications and Public Information.

The data were analyzed by using a Pearson's product-moment correlation matrix and a t-test. The t-test was used to compare the dependent variables of student achievement, behavior, attendance and teacher turnover to the independent variable of school facilities. Pearson's r was used to demonstrate the relationship between the independent variables on various sections of the TLEA Questionnaire.

O'Neill's findings indicated that building conditions had a positive impact on student achievement. The results of the t-test and the Pearson product- moment correlation for dependent variables showed that several independent building variables had a significant impact on student achievement. O'Neill cited building age as having the strongest relationship with student achievement. Student achievement was also influenced by the location of the learning areas within the school as well as by internal and external noise. Additionally, student academic performance was positively related to building conditions on all sections of the Texas Assessment of Academic Skills.

O'Neill found that student achievement was higher in newer buildings, as well as in those buildings with higher quality ratings. His findings were consistent with previous studies (Cash, 1993 and Earthman, Cash & Van Berkum, 1996) in which a building assessment instrument was used to assign the ratings of above-standard, standard and sub-standard to school buildings. This study also confirmed earlier hypotheses that suggested

the physical conditions of a school building have the ability to directly influence what is happening inside the building. O'Neill (2000) stated that when school facilities are well designed and maintained they influence the learning environment for students, teachers, and community.

International Study on Building Conditions and High Schools

Al-Enezi (2002) looked to generalize the studies conducted by Cash (1993), Earthman et al., (1996), Hines (1996), and Lanham (1999). He wanted to investigate the relationship between school building conditions and academic achievement in schools outside the United States. He set out to examine whether the condition of school facilities influenced the academic achievement of twelfth grade students in Kuwaiti public schools. For this study, a target population of 28 boys' schools and 28 girls' schools were selected. These schools were chosen because their students are assessed by subject area standardized tests prepared by specialists from the Kuwait Ministry of Education.

Data were collected using Cash's revised Commonwealth Assessment of Physical Environment (CAPE) which was translated into Arabic, the language of Kuwait. Fifty-six principals were selected to participate in this survey and all participants returned the survey. Student academic achievement was determined by obtaining the mean scores of 12th grade students attending the schools in the study from the Kuwaiti Educational Information Agency.

Al-Enezi conducted a non-experimental design to explore the relationship between different variables. The relationship between building conditions and student achievement was analyzed using Pearson's product moment correlation, two-way factorial ANOVA, t-test, multiple regression and step-wise multiple regression.

Pearson's product moment correlation concluded that there was a positive correlation between the boys' schools building condition and their achievement. Using building conditions and gender as independent variables and student achievement as the dependent variable, the two-way ANOVA concluded that building conditions significantly impacted academic achievement. Al-Enezi, using a t-test, found there was a significant difference between academic subjects only in the boys' schools. Using multiple regression analysis revealed that building conditions explained a variance in achievement in science majors but not in Arts majors. The use of step-wise multiple regression identified the physical aspects of graffiti and roof leaks to be the main predictors of student academic achievement.

Al-Enezi concluded that a significant relationship existed between the overall, the structural, and the cosmetic conditions of a building and student achievement. Additionally, he found that the effects of building conditions on student achievement varied according to the student's gender and academic majors.

Although Al-Enezi's study supported the findings of previous studies (Cash, 1993; Earthman, Cash & Van Berkum, 1996; Hines, 1996 and Lanham, 1999) there are questions regarding his findings. Since he was unable to establish a fixed score for each building (i.e. sub-standard, standard and above-standard) the ability to establish a relationship between student academic achievement and building conditions is limited. It would also appear that the significance of these relationships needs to undergo a more in-depth examination to determine the level to which building conditions influence student achievement**.**

Summary

Since the early 1980's numerous studies have been conducted to determine the influence that building conditions had on student academic achievement. In an effort to provide a more thorough understanding of the relationship between school building conditions and student academic achievement this section reviewed some of the literature which investigated this topic. The research indicates that student academic achievement improves with improved building conditions and that a variety of physical factors have a substantial effect on student behavior and academic outcomes. However, sample sizes vary between studies as does the relationship between academic achievement and building conditions. This suggests that further studies need to be conducted in this area in order to develop a more precise understanding of the impact that building conditions exert upon the academic achievement of students.

Chapter 3: Methodology

Chapter 3 describes the research design, population and sample of this study. It also identifies the setting and context for the study, including a discussion of the Pennsylvania System of School Assessment (PSSA). The methods of data collection as well as the instrument for measuring student achievement are discussed. Lastly, the statistical methods used for analysis in this study, including the identification of variables used to analyze the data, are described.

Setting

The Department of Education in the Commonwealth of Pennsylvania supervises 501 rural and urban school districts throughout the state and provides educational services to more than 1.8 million students. All public schools in Pennsylvania are governed by the Pennsylvania School Code which is based upon Pennsylvania's content and achievement standards. In 1999, the Pennsylvania State Board of Education adopted Chapter 4 of the Pennsylvania School Code which replaced the previous Chapters 3, 5 and 6. Chapter 4 provided for the establishment of detailed academic standards and accompanying assessments to facilitate the improvement of student achievement as well as to provide parents and communities with a measure by which school performance can be determined. (Pennsylvania Department of Education, 2001)

Under this section, Pennsylvania made it mandatory that all students in grade 3, grade 5, grade 8 and grade 11 take the Pennsylvania System of School Assessment (PSSA) academic standards tests for reading and mathematics. Students in grade 6, grade 9 and grade 11 must also take the PSSA test in writing.

The Pennsylvania System of School Assessment (PSSA) is not new to the Commonwealth of Pennsylvania. Since 1970, Pennsylvania has conducted some form of assessment. The academic standards associated with the PSSA were initially developed as a result of input from representative groups of teachers, college and university professors, staff of the Pennsylvania Department of Education, parents, and community leaders throughout the Commonwealth of Pennsylvania. The criteria used to formulate these standards were obtained from the standards of other states, national benchmarks, and international academic standards. The Pennsylvania State Board of Education had national experts on standards review Pennsylvania's academic standards (Pennsylvania Department of Education, 2001). These standards identify the academic skills a student should know and be able to satisfactorily demonstrate at specific grade levels. The PSSA was designed to assess these academic skills.

The PSSA is administered annually on a statewide basis during the spring semester to students in grades 3, 5, 8 and 11. The test provides school districts with academic data, on an individual, building and district level that assists them in the identification of academic strengths and weaknesses. Since the adoption of Chapter 4, statute 4.51 (Pennsylvania Code, 2005), the PSSA test has undergone several revisions in order to ensure continuity with the Pennsylvania Academic Standards. The Pennsylvania Accountability System, which is based on the Pennsylvania School Code, meets the requirements of the Federal *No Child Left Behind* legislation and has the same objective - having every child in the Commonwealth at or above the proficiency level in reading and mathematics by the year 2014 (Pennsylvania Department of Education, 2001).

Research Design

Since this study was non-experimental, a descriptive research methodology design was used. In quantitative research the aim of a study is to determine the relationship between one phenomena and another in a population, whereas a descriptive study establishes associations between variables. (Hill, 2002) The descriptive research design was used to answer the following questions:

1. Is there a relationship between overall school building conditions and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?
2. Is there a relationship between the cosmetic conditions of school facilities and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?
3. Is there a relationship between the structural conditions of school facilities and student academic achievement in Pennsylvania's high schools when socio-economic status (SES) is held constant?

Population and Sample

Prior studies in this field conducted by Cash (1993), Hines (1996) and Lanham (1999) have focused on high schools and elementary schools in the Commonwealth of Virginia. In addition, Earthman, Cash and Van Berkum (1996) conducted a study of North Dakota's high schools, in order to investigate the possible relationship between selected student variables and school building conditions. In order to broaden the data base studying the relationship between building conditions and student academic achievement, and as a result increase the understanding of this relationship, it is necessary to conduct

additional research in different school settings across the United States. These additional studies will provide further information regarding the influence of various building characteristics on student achievement.

Previous studies have concluded that inadequate high school facilities negatively influenced academic achievement in both urban (Hines, 1996) and rural (Cash, 1993) environments within Virginia. Earthman, Cash and Van Berkum (1996) reached similar conclusions in their North Dakota study. Consequently, it is important to determine if the same negative influences on academic achievement that are present in schools within the Commonwealth of Virginia and the state of North Dakota are present in the educational settings of other states, such as the Commonwealth of Pennsylvania.

The Commonwealth of Pennsylvania has within its jurisdiction 501 school districts that have high schools. However, for purposes of this study, a high school will be defined as a building that has an eleventh grade as part of its configuration. In all these high schools the PSSA test is mandatory for eleventh grade students. Pennsylvania has 429 high schools which have a configuration of grades 9-12 or grades 10-12. A list of all high schools meeting the criteria for this study was developed using the Pennsylvania Department of Education database as the source.

These schools are distributed throughout the state and were identified as the population for this study. During the time the research was conducted, student enrollment in the selected high schools ranged from a low of approximately 200 students to a high of approximately 3500 students.

The 429 high schools that have an eleventh grade as part of its configuration were the target population for this research. The sample size for this study was determined by

using the sample size tables presented in the paper by Krejcie and Morgan (1970). In order to obtain results that are reflective of the target population, and significant at the .05 level of confidence, it was determined that at least 201 high schools needed to be surveyed.

An alphabetical list of all high schools meeting the criteria for this study was developed from the Pennsylvania Department of Education database and assigned a number that was determined through random selection, using a table of random numbers. Those high schools assigned a number from 1 to 201 provided the initial sampling population. If, as a result of initial surveys not being returned, additional schools were needed to complete this study they were selected from those schools remaining on the list starting with number 202.

Instrument Development

To examine the overall building conditions, the structural building conditions and the cosmetic building conditions, a survey was developed and administered to all the high school principals identified in the sample. This instrument will be based largely on the Commonwealth Assessment of Physical Environment (CAPE) developed by Cash (1993), used by Hines (1996) and utilized with modifications by Lanham (1999) and El-Enezi (2001). However, after reviewing the results and literature from the Cash (1993), Hines (1996), Lanham (1999) and Al-Enezi (2002) studies, modifications to this survey were made by the researcher. The survey question analysis and building condition breakdown are identified in Table 6.

Table 6

Revised CAPE Survey Question Analysis of the Structural and Cosmetic Building Conditions

Building Condition	Variable	Survey question
Structural Condition Questions	Building Age	1
	Years since last renovation	2
	Temporary classrooms	3
	Windows in instructional areas	4
	Classroom flooring	5
	Roof leaks	8
	Noise producing environment	9
	Classroom electrical outlets	10
	Classroom structural characteristics	11
	Structural building condition rating	12
	Classroom heating	13
	Classroom air condition	14
	Facilities adjacent to building-soccer	16
	Facilities adjacent to building-basketball	16
	Facilities adjacent to building-baseball	16
	Facilities adjacent to building-swimming	16
	Facilities adjacent to building-tennis	16
	Facilities adjacent to building-football	16
	Ceiling material	17
	Classroom lighting	18
Cosmetic Condition Questions	Interior painting	6
	Exterior painting	7
	Floor sweeping/mopping frequency	15
	Classroom furniture	19
	Graffiti location-bathrooms	20
	Graffiti location-lockers	20
	Graffiti location-hallways	20
	Graffiti location-classrooms	20
	Graffiti location-exterior walls	20
	Graffiti location- exterior walkways	20
	Graffiti location-exterior surface	20
	Graffiti removal	21
	Overall classroom cosmetic condition	22
Questions relating to High School Building Conditions	Overall maintenance	23
	Overall school conditions	24
	Student population	25

The following questions in the CAPE survey were modified for the purposes of this study. These modifications resulted in assigning a numerical value of 1, 2, 3, 4, 5, 6, or 7, depending on the question responses. Where a particular question requires a choice between one of three responses ("a" to "c"), answer "a" will be coded as a one; answer "b" will be coded as a two; and answer "c" will be as a coded three. For a question requiring four responses; answers "a" will be coded as a one; answer "b" will be coded as a two; answers "c" will be coded as a three and answer "d" will be coded as a four. When a particular question requires a choice between one of six or seven responses ("a" to "g"), answer "a" will be coded as a one; answer "b" will be coded as two; answer "c" will be coded as three; answer "d" will be coded as a four; answer "e" will be coded as five; answers "e" will be coded as six and answer "e" will be coded as seven.

Question one asks about building age and provides respondents with seven possible responses of "a" through "g". School buildings 60 years or older (a) will be coded as one; school buildings 50-59 years old (b) will be coded as two; school buildings 40-49 years old (c) will be coded as three; school buildings 30-39 years old (d) will be coded as four; school buildings 40-49 years old (e) will be coded as five; school buildings 10-19 years old (f) will be coded as six and school buildings under 10 years (g) will be coded as seven.

Question two asks when the last major renovation was completed. The responses will be coded one if renovations took place between 1980 -1989; two if renovations took place between 1990 -1999; and three if renovations took place from 2000 to the present day. Lanham (1999) modified original CAPE to include information regarding building renovations. An open ended response requiring a numerical answer was added to his

survey instrument. Lanham's modification was changed into a three choice response that provides for more consistency in the scoring.

Question five asks the school principal how many portable classroom buildings are utilized. Schools using over 15 portable classrooms (a) will be coded as one; schools using at least six but less than fifteen portable classrooms (b) will be coded as two; and schools using at least five (c) or no portable classrooms (d) will be coded as three. Lanham (1999) modified the CAPE to include information regarding mobile classrooms or trailers. An open ended response requiring a numerical answer was added to his survey. This was changed into a three choice response that provides for more consistency in the scoring

Question eighteen asks which facilities are adjacent to, or part of the school complex. It was changed to include responses more applicable to high schools in Pennsylvania. The choice of softball field was removed and replaced with basketball courts. The six possible facilities listed are: soccer fields, basketball courts, baseball fields, swimming pools, tennis courts and football fields. The response will be coded one if they selected soccer; two if they selected outdoor basketball courts; three if they selected baseball fields; four if they selected swimming pool; five if they selected tennis courts and six if they selected football fields.

Question twenty asks which locations is graffiti most commonly found in the high school. The seven possible locations with a selection of "yes" or "no" identified are: bathrooms; lockers; hallways; exterior walls; exterior walkways and other exterior surfaces. The response will be coded one if they selected "yes" and two if they selected "no".

Question twenty-five asks about school enrollment and provides respondents with seven possible responses of “a” through “g”. School buildings with over 3500 students (a) will be coded as one; school buildings with 3000-3499 students (b) will be coded as two; school buildings with 2500-2999 students (c) will be coded as three; school buildings 2000-2499 students (d) will be coded as four; school buildings with 1500-1999 students (e) will be coded as five; school buildings wilt 1000-1499 students (f) will be coded as six and school buildings with 500-999 students (g) will be coded as seven. A description of the survey question response types and an accompanying scoring code is presented in Table 7.

The Pennsylvania System of School Assessment does not test student’s ability in science. Therefore, it was not necessary to evaluate the condition of the science facilities in the schools. As a result, questions on the original CAPE that related to science facilities were omitted. These questions were: “Which utilities or equipment are available and in useable conditions in the science labs?" and “How long ago was science equipment updated to current standards?”

Scoring

The purpose of this modified CAPE was to identify groups, based upon the overall building condition rating, the cosmetic building condition rating and the structural building condition rating of the selected high school buildings. Survey items were used to assess the condition of each building. The responses for each item on the CAPE were coded as a one, a two, a three, a four, a five, a six or a seven.

Table 7

Survey Question Response Type and Instrument Coding

Survey Response type	Survey Question	Variable	Survey response coding
Yes-No options	20	Graffiti locations	Yes- 1 No- 2
Three-option Response	2	Years since last renovation	A- 1
	5	Windows in instructional areas	B- 2
	6	Interior painting	C- 3
	7	Exterior painting	
	8	Ceiling leaks	
	9	Noise producing environment	
	10	Classroom electrical outlets	
	11	Classroom structural characteristics	
	12	Structural building condition rating	
	13	Classroom heating	
	14	Classroom air condition	
	15	Floor sweeping frequency	
	17	Ceiling material	
	18	Classroom lighting	
	19	Classroom furniture	
	21	Graffiti removal	
	22	Overall cosmetic	
	23	Overall maintenance	
	24	Overall school conditions	
Four-option Response	3	Temporary classrooms	A-1; B-2;
	4	Classroom flooring type	C-3; D-4
Six-option response	16	Facilities adjacent to the school building	A-1; B-2; C-3; D-4; E-5; F-6
Seven-option Response	1	School building age	A-1; B-2; C-3
	25	Student enrollment	D-4; E-5; F-6 G-7

Survey Administration

The survey questions were loaded into the 'Survey Monkey' website, a professional online software program that allows surveys to be sent electronically, via e-mail addresses, to all selected high school administrators. These participants, when they opened their e-mail, found an introductory letter as well as a link to the survey. Included in the body of the e-mail was an explanation regarding the purpose of the survey; the importance of each participant responding; and a statement assuring the participants that their responses will be confidential. A post card as well as an e-mail was sent to all participants one week after the initial e-mail. These notifications thanked them for their participation and reminded those who had not yet responded to please do so. After two weeks an additional e-mail, with another link to the survey, was sent to those who had still not returned their surveys, urging them to participate**.** Finally, after three weeks, an additional e-mail and survey was sent to those who have not yet responded, requesting their cooperation. If, at the end of four weeks, the targeted number of responses were not received, e-mails and surveys were sent to those high schools, on the master list, that were numerically next in line. This process continued until the required number of responses was received.

Survey Return

Four hundred and twenty-nine high schools were selected as the sample for this research study. During the month of March, 2006 320 e-mails were sent via Survey Monkey to principals or acting principals identified as participants in this study. Telephone calls had to be made to those principals who were not able to be contacted by e-mail to request their participation in the research study. By April, 2006 164 principals (53%) from

this original group of 320 had responded to the questionnaire. In order to increase the number of respondents, 113 additional high school principals were contacted through e-mails and telephone calls requesting their participation in the survey. A verbal commitment regarding participation was received from 57 high school principals in this group. However, surveys were received from only 41 high school principals. By May 2006, 205 Pennsylvania high school principals from a survey population of 429 high school principals, 48%, had submitted a response to the survey instrument. This met the target population of 201respondents at the .05 level of confidence.

Data Collection

This study was designed to establish if a relationship exists between student academic achievement and building conditions. Data regarding student academic achievement, building and classroom conditions, and student socio-economic status were required in order to complete this study. Data concerning the rating on building and classroom conditions was collected from the selected high school principals using a survey designed specifically for this study. Student academic achievement data for the 2002-2003 school year, the 2003-2004 school year and the 2004-2005 school year was obtained from the Pennsylvania Department of Education website.

Student scores on the Pennsylvania System of School Assessment (PSSA) exams in mathematics, reading and writing were used to assess academic achievement. The three year average percentile ranking of 11^{th} grade student achievement on the mathematics, reading and writing exams was identified. The PSSA exam groups students into four categories based on their performance: advanced, proficient, basic and below basic. Since these scores were not in scaled form, and it was necessary to do so, a numeric ranking from

100 to 400 was created. In order to create this numeric ranking the percentile ranking in each category was multiplied by number from one to four. If the percentile ranking was in the advanced group it was multiplied by four; the percentile ranking was multiplied by three if they were proficient; the percentile ranking was multiplied by two if they were basic and the percentile ranking was multiplied by one if they were below basic. These numbers were then divided by four. The number created as a result of this multiplication/division process was a scale score that was used as the dependent variable for student academic achievement at the respective school. In order to control the variance related to socio-economic status (SES), data detailing the percentage of students on free and reduced lunch compared to the number of students enrolled in the high school during the 2004-2005 school year was used as a covariant to account for the academic achievement variance related to SES. Data detailing the number of students participating in the free and reduced lunch program were obtained from the Pennsylvania Department of Education website and were used as an indicator of socio-economic status in this study.

Variables

The independent variables, cosmetic conditions, structural conditions and overall conditions of school buildings, were the major focus of this study. Another independent variable, socio-economic status, served as a control variable and was also addressed in this study. The dependent variable for this study was student academic achievement. Student academic achievement was based upon the percentile ranking obtained from the three year average student score on the PSSA exams in mathematics, reading and writing.

Reliability

To test the reliability of the modified Commonwealth Assessment of Physical Environment (CAPE) survey instrument, a Cronbach alpha reliability test was conducted. Cronbach alpha measures the internal consistency of the survey instrument. Scores can range from 0.0 to 1.0, with a reliability coefficient of .70 or higher considered "acceptable" in most research settings (Nunnally, 1978). Table 8 identifies the results of the reliability test.

Data Analysis

When the survey instruments were received from the participating schools, the data were entered into the Statistical Package for the Social Sciences (SPSS), which is a software package used for conducting statistical analyses, manipulating data, and generating tables and graphs which summarize data. This program provided the researcher with statistical data concerning the effects of the independent variables of cosmetic building conditions, structural building conditions, overall building conditions of school buildings and socio-economic status on the dependent variable of student academic achievement when a stepwise multiple regression analysis is conducted. This program helped identify those independent variables that most significantly influence the dependent variable. It also provided the researcher with information regarding the multiple correlation (R); and any statistical significance that exists between the independent and dependent variables based on reported *b* and Beta weights; α of .05 Alpha level will be set at p=.05 for this analysis. Previous studies conducted by Cash (1993), Hines (1996), Lanham (1999) and Al-Enezi (2001) have interpreted the data using a variety of statistical methods

Table 8

Cronbach Alpha Reliability Coefficient for Overall Building Conditions, Cosmetic Building Conditions and Structural Building Conditions from the modified Commonwealth Assessment of Physical Environment (CAPE)

CAPE category	Number of Questions	***Cronbach Alpha Coefficient***
Overall Building Conditions Category	25	.7671
Cosmetic Building Conditions Category	7	.7473
Structural Building Conditions Category	15	.6439

Note: Topics analyzed; students enrolled; building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of flooring; interior painting; exterior painting; roof leaks; ceiling material; type of classroom lighting; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; floor sweeping frequency; number and type of facilities located adjacent to the school; graffiti locations; graffiti removal; overall building maintenance; overall cosmetic classroom rating and overall building condition rating.

including t-test, Analysis of Covariance, Pearson's correlation, regression analysis and step-wise regression analysis.

In this study the research questions were analyzed using a step-wise multiple regression analysis. This statistical method allows for a study of the relationship between the dependent variable, student academic achievement, and the independent variables, overall building conditions, cosmetic building conditions and structural building conditions. A step-wise multiple regression analysis identifies which, if any, are significant predictors of student academic achievement, and the relative contributions of each individual variable to the overall relationship.

A step wise multiple regression analysis was used to identify the best predictor of the relationship between the dependent variable of student academic achievement and the independent variables of overall building conditions, cosmetic building conditions, structural building conditions and socio-economic status.

Summary

The purpose of this chapter was to identify the methodology of this study. This chapter also described the setting, the population and sample size, and variables. Additionally, the research design, instrument development and data collection and data analysis procedures have been identified.

CHAPTER 4: Findings

This chapter provides a descriptive analysis of the responses from Pennsylvania high school principals on the modified Commonwealth Assessment of Physical Environment (CAPE) survey used in this study. Data from all respondents has been recorded and analyzed using the on-line survey provider Survey Monkey. Results of the data analyzed using a step-wise multiple regression analysis, to identify if a relationship exists between overall, cosmetic and structural building conditions of Pennsylvania's high schools and student academic achievement on the PSSA writing, reading and mathematics exams, are included.

Survey Respondents

Pennsylvania high school principals were requested to complete a 25 question multiple choice survey that would describe the overall building conditions, the structural building conditions and the cosmetic building conditions of their respective high schools. They were asked to choose the best response for each question and to use their best judgment and experience as the building principal and/or building facilities administrator when answering the questions. Two hundred and five principals out of four hundred and twenty-nine, a response rate of 48%, responded to the survey request. The results of this survey are summarized in three sections: Structural Building Conditions identified with Tables 9 to 23; Cosmetic Building Conditions with accompanying Tables 24 to 30; and Questions relating to high school building conditions with accompanying Tables 31 to 33.

Structural Building Conditions

The structural building conditions of the high schools involved in this research was identified through information provided by the principals on the following characteristics:

building age, building renovation, temporary classrooms, classroom windows, classroom flooring, roof leaks, exterior noise, electrical service, classroom structure, structural building rating, heating, air-conditioning, adjacent facilities, ceiling material and classroom lighting. The responses of the Pennsylvania high school principals to the 15 questions examining the structural conditions of their high schools are presented in Tables 9 to 23.

Age of School Building

The first question asked high school principals to give the age of their school building. Answers were based on the time period during which most of the space used by students was built. School building ages ranged from 60 years or older (15%) to high school buildings that were under 10 years old (18.5%). The majority of the high school buildings were being between 40-49 years old (22.4%) and 39-30 years old (16.6%). One principal did not answer this question. Table 9 summarizes the responses.

Table 9

Age of School Building

Age of school building	n	%
60 years or older	30	14.6
50-59 years	40	19.5
40-49 years	46	22.4
30-39 years	34	16.6
20-29 years	9	4.4
10-19 years	7	3.4
Under 10 years	38	18.5
Missing responses	1	0.5
Total	205	100.0

Building Renovation/Addition

Question two asked high school principals to identify the time period during which the last major renovation/addition was done to their building. Fifty-three percent of the respondents stated that they had their last renovation/addition after the year 2000. Thirty-five percent of the principals reported that they had their last renovation/addition between the years 1990-1999 while twelve percent stated that the last renovation/addition to their building occurred between the years 1980-1989. Thirty-five high school principals skipped this question because they have buildings that are under 10 years old, some of the principals who responded back to the researcher stated that they did not answer the questions because their building is less than 10 years old and has not undergone any renovations since its construction. Responses to question two are summarized in Table 10.

Table 10

Building Renovation/Addition

Building renovation/addition	n	%
1980-1989	20	9.7
1990-1999	60	29.3
2000-Present	90	43.9
Missing responses	35	17.1
Total	205	100.0

Temporary Classrooms

The third question asked high school principals to identify the number of temporary classrooms utilized for educational purpose by the school. Eighty-nine percent of high school principals stated they do not use any temporary classrooms for educational purposes. An additional 6% reported they had more than 6 but less than 10 temporary classrooms being used while 4% stated they have over 11 temporary classrooms being used. Two high school principals did not respond to this question. A summary of the responses are in Table 11.

Table 11

Temporary Classrooms

Temporary classrooms	n	%
Over 15	3	1.5
11-15	5	2.4
6-10	13	6.4
None	182	88.7
Missing responses	2	1.0
Total	205	100.0

Type of Classroom Flooring

The fourth question asked high school principals to identify which type of flooring is found in a majority of the instructional spaces in their building. Almost sixty-eight percent of the principals reported that tile flooring was found in a majority of their classrooms. Approximately 17% of the respondents stated they had carpet flooring with about 13% reporting that they had terrazzo flooring. A little over 1% of the principals

indicated that they had wood flooring in the majority of their classrooms. Table 12 summarizes these responses.

Table 12

Type of Classroom Flooring

Type of classroom flooring	n	%
Wood Floor	3	1.4
Tile	139	67.8
Terrazzo	27	13.1
Carpet	36	17.6
Missing responses	0	0.0
Total	205	100

Windows in the Instructional Areas

Question five asked high school principals to identify how many instructional spaces (classrooms) have windows. Over 82% of the high school principals reported that their buildings had windows in at least three-fourths of the instructional areas. Ten percent of the principals reported they had windows in at least one-fourth of the instructional spaces while 7% of the principals responded that they had windows in less than one-fourth of the instructional areas. The responses to question four are summarized in Table 13.

Table 13

Windows in Instructional Areas

Windows in instructional areas	n	%
Windows are in fewer than 1/4th of the instructional spaces	15	7.3
Windows are in at least 1/4th of the instructional spaces	21	10.3
Windows are in at least 3/4th of the instructional spaces	169	82.4
Missing responses	0	0.0
Total	205	100.0

Roof Leaks

Question eight asked high school principals to identify the condition of their ceiling and asked them to look at the susceptibility of water damage to the ceiling. Fifty-nine per cent of respondent stated they had no visible signs of water damage or had a few old water spots on the ceiling. Approximately 28% of the principals reported that their ceilings are developing new stains while a little over 12% indicate that the ceiling is deteriorating due to water damage. One principal did not provide an answer to this question. Responses are summarized in Table 14.

Table 14

Roof Leaks

Roof leaks	n	%
Ceiling is deteriorating due to water damage, and/or water falls in some areas of the facility requiring buckets for water collection	26	12.7
Ceiling is currently developing a few new stains due to minor leaks	57	27.8
No visible signs, or only a few old water spots in ceiling	121	59.0
Missing responses	1	0.5
Total	205	100.0

Noise Producing Environment/Facility Location

The ninth question asked high school principals if their building is located near a busy major highway, a frequently used rail line, an area where aircraft frequently passed overhead or any other loud noise producing environment. If it was located in such an area, the principals were asked to identify if any measures have been taken in order to reduce the level of noise within the facility. Approximately 81% of the respondents reported that they are not located near a noise producing environment. A little more than 7% of the principals indicated that they are located near a noise producing environment but measures have been taken to reduce the noise level within their building. However, the remaining 10% of the respondents said that no measures have been taken to reduce the noise level in their buildings. Three principals did not answer this question. A summary of the responses are presented in Table 15.

Table 15

Noise Producing Environment/Facility Location

Noise producing environment/facility location	n	%
Yes, and no measures have been taken to reduce the level of noise within the facility	22	10.7
Yes, but measure have been taken to reduce the level of noise within the facility	15	7.3
No	166	81.0
Missing responses	2	1.0
Total	205	100.0

Classroom Electrical Outlets

Question ten asked high school principals to indicate the number of electrical outlets located in each classroom. Fifty-one per cent of the high school principals reported they have at least one outlet per wall or at least four in each classroom. Approximately 44% reported having two or three outlets in each classroom and about 5% reported having only one outlet in each classroom. Two principals did not answer this question. Responses to question ten are summarized in Table 16.

Table 16

Classroom Electrical Outlets

Classroom electrical outlets	n	%
There is at least one outlet per wall in each classroom, or four or more outlets in each classroom	104	50.7
There are two or three outlets in each classroom	89	43.4
There is one outlet in each classroom	10	4.9
Missing response	2	1.0
Total	205	100.0

Structural Characteristics of Classrooms

Question eleven asked principals to indicate which statement provides the best description of the classrooms in their schools. Almost, 98% of the high school principals stated that their classrooms are self-contained spaces with a door that can be locked. The remaining 2% of the principals reported having classrooms in modified open spaces using partitions or furniture to identify classroom boundaries. One principal did not answer this question. A summary of the responses are presented in Table 17.

Table 17

Structural Characteristics of Classrooms

Structural characteristics of classrooms	n	*%*
Classes are held in open space areas shared with other classes	0	0
Classrooms are in modified open spaces using movable partitions or furniture to identify classroom boundaries	4	1.9
Classrooms are self-contained spaces with a door that can be closed	200	97.6
Missing responses	1	0.5
Total	205	100.0

Structural Building Conditions Rating

Question twelve asked high school principals to rate the structural condition of their school buildings. Over 80% of the high school principals rated the structural condition of their school as outstanding or satisfactory, while 19% stated that the structural condition of their high school is in need of improvement. Table 18 summarizes the responses.

Table 18

Structural Building Conditions Rating

Structural building conditions rating	n	%
Needs Improvement	39	19.0
Satisfactory	73	35.6
Outstanding	93	45.4
Missing responses	0	0.0
Total	205	100.0

School Heating System

Question thirteen asked high school principals to identify how the heating system in their school performed and whether they were able or unable to control the heating in the classroom. Over 62% of respondents reported that they were unable to control the heating system in their classrooms while approximately 37% of the principals stated that they were able to control the heat in each classroom. Table 19 lists the responses to question thirteen.

Table 19

School Heating System

School heating system	n	%
Uneven heat/unable to control in each room	86	41.9
Even heat/unable to control each room	42	20.5
Even heat/able to control each room	77	37.6
Missing responses	0	0.0
Total	205	100.0

Air Conditioning within the Instructional Area

The fourteenth question asked principals to indicate if their school has an air conditioning system for instructional areas and, if they do, whether the air conditioning was well regulated or not well regulated in those areas. Approximately 34% of the principals stated that they have an air conditioning system in all instructional areas of their school and that it is well regulated. Over 45% of the principals indicated that they have air conditioning in some instructional areas or that the air conditioning is not well regulated. Twenty percent of high school principals reported that they had no air conditioning systems in their instructional spaces. One principal did not answer this question. Table 20 summarizes the responses to question fourteen.

Table 20

Air Conditioning within the Instructional Areas

Air conditioning within the instructional areas	n	%
No air conditioning in instructional spaces	41	20.0
Air conditioning in some instructional spaces, or air conditioning in all instructional spaces, but not well regulated	93	45.4
Air conditioning in all instructional spaces which can be well-regulated	70	34.1
Missing responses	1	0.5
Total	205	100.0

Facilities Adjacent to the School

Question sixteen asked high school principals to identify those facilities that are adjacent to, or part of, the school complex. Respondents were directed to identify all facilities that apply to their high school. Eighty-eight per cent of high school principals reported that a football field was adjacent to their high school. Eighty- three percent reported that they had a soccer field and baseball field adjacent to their high school. Seventy- three percent reported that tennis courts were adjacent to the high school, 48% indicated that they had a swimming pool while 32% reported that they had outdoor basketball courts. Fifteen principals skipped this question. The responses for question sixteen are summarized in Table 21.

Table 21

Facilities Adjacent to the School

Facilities adjacent to school	n	%
Soccer field	158	83.1
Outdoor basketball court	61	32.1
Baseball field	158	83.1
Swimming pool	92	48.4
Tennis Courts	139	73.0
Football field	169	88.9

*Valid responses= 190

Ceiling Material

The seventeenth question asked the high school principals to identify the type of material that is used for the interior classroom ceilings. Seventy-three per cent of the high school principals reported that they had acoustical tiles throughout the instructional spaces. The remaining principals stated that plaster or acoustical tiles were in at least 3/4ths of the instructional spaces in their buildings. Two principals did not answer this question. Table 22 summarizes the responses to question 16.

Table 22

Ceiling Material

Ceiling material	n	%
Wood	0	0
Plaster or acoustical tiles in at least 3/4 of the instructional spaces	54	26.3
Acoustical tile throughout the instructional spaces	149	72.7
Missing responses	2	1.0
Total	205	100.0

Type of Classroom Lighting

Question eighteen asked high school principals to identify the type of lighting that is used in the instructional areas of their buildings. Approximately 63% of the principals reported that they had cold fluorescent lighting in their instructional areas. Twenty-five percent of the respondents reported that their classrooms had hot fluorescent lighting while approximately 9% stated that their classrooms were equipped with incandescent lighting. Eight principals did not answer this question. A summary of the responses to question eighteen are presented in Table 23.

Table 23

Type of Classroom Lighting

Type of classroom lighting	n	%
Incandescent lighting	17	8.3
Fluorescent lighting- Hot	50	24.3
Fluorescent lighting- Cold	130	63.4
Missing responses	8	4.0
Total	205	100.0

Cosmetic Building Conditions

The cosmetic building conditions of the high schools participating in this research were determined through responses provided by the respective building principals. The principals responded to questions that addressed areas commonly associated with cosmetic conditions. These areas include interior painting cycle; exterior painting cycle; the frequency of floor cleaning; the condition of classroom furniture; the presence of graffiti in the building; the removal of graffiti; and an overall rating of the cosmetic condition of their classrooms. The responses that these Pennsylvania principals had to the questions concerning the cosmetic conditions of their high schools are summarized in Table 24 to 30.

Interior Painting Cycle

The sixth question asked high school principals when the last time the interior walls including the classroom spaces were painted. Approximately 74% of the high school principals reported that interior painting occurred less than eight years ago. Thirteen percent reported that interior painting occurred between 8-15 years ago while

approximately 10% stated that interior painting was last done over 15 years ago. Seven principals did not answer this question. Responses to question six are listed in Table 24.

Table 24

Interior Painting Cycle

Interior painting cycle	n	%
Over 15 years ago	19	9.2
Between 8 to 15 years	27	13.2
Less than 8 years ago	152	74.2
Missing responses	7	3.4
Total	205	100.0

Exterior Painting Cycle

Question seven asked high school principals to indicate when the last time their high school had the exterior walls, windows or trim painted. Forty-one per cent of the principals stated that exterior painting occurred more than seven years ago. Twenty-two percent of the principals stated that the last exterior painting of their building occurred between four and seven years ago while 34% of the principals reported that exterior painting occurred no more than four years ago. Nine principals did not answer this question. Table 25 presents the responses to the question.

Table 25

Exterior Painting Cycle

Exterior painting cycle	n	%
Over 7 years ago	84	40.9
Between 4 to 7 years	44	21.6
Less than 4 years ago	68	33.2
Missing responses	9	4.3
Total	205	100.0

Frequency of Floor Cleaning

Question fifteen asked high school principals to identify how often the floors in their building are swept or vacuumed. Almost 86% of the high school principals reported that the floors in their instructional area are swept or vacuumed at least on a daily basis. Thirteen percent stated that the floors are cleaned weekly while about1% of high school principals reported floors are cleaned on a monthly basis. A summary of the responses to question fifteen are listed in Table 26.

Table 26

Frequency of Floor Cleaning

Frequency of floor cleaning	n	%
Monthly	2	0.9
Weekly	27	13.2
Daily or more frequently	176	85.9
Missing responses	0	0.0
Total	205	100.0

Condition of Classroom Furniture

Question nineteen asked the high school principals to indicate which of three statements best describes the conditions of the classroom furniture in their building. Approximately sixty-three per cent of the high school principals reported that their classroom furniture was attractive and functionally sound. Thirty-three percent of the principals stated that the furniture in at least half the rooms in their high school were functionally sound but had some minor scars. Almost 4% of the high school principals indicated that most rooms had furniture that was either facially scarred or functionally damaged. One principal did not answer this question. The responses to question nineteen are summarized in Table 27.

Table 27

Condition of Classroom Furniture

Condition of classroom furniture	n	%
Most rooms have furniture that is either facially scarred or functionally damaged	8	3.9
At least half of rooms may have some minor facial scars on students desks, all the furniture is functionally sound and looks satisfactory	68	33.2
All classrooms have furniture which was functionally sound and facially attractive	128	62.4
Missing responses	1	0.5
Total	205	100.0

Graffiti Locations

Question twenty asked high school principals where is the most common area in which they find graffiti. Over thirty-two per cent of high school principals reported they commonly found graffiti in the bathroom, while sixty-six percent of respondents did not find any graffiti in their bathrooms. Additionally, approximately nine per cent of high school principals found graffiti on lockers in their school and slightly more than ninety per cent of respondents did not find any graffiti on school lockers. Furthermore, over ninety-five per cent of respondents did not find any graffiti in the areas: hallways; classroom walls/doors; exterior walls; exterior walkways and other exterior surfaces. Two high school principals did not answer any part(s) of this question. Responses to question twenty are summarized in Table 28.

Table 28

Graffiti Locations

Graffiti locations	Yes	%	No	%	Missing responses	%
Bathrooms	67	32.7	136	66.3	2	1.0
Lockers	18	8.8	185	90.2	2	1.0
Hallways	5	2.4	198	96.5	4	2.0
Classroom Walls/Doors	4	2.0	199	97.1	2	1.0
Exterior Walls	8	3.9	195	95.1	2	1.0
Exterior Walkways	5	2.4	198	96.5	2	1.0
Other exterior surfaces	5	2.4	198	96.5	6	2.9

* Valid response=205

Time before Graffiti Removal

Question twenty-one asked the high school principals to indicate how long graffiti remains on the surfaces of their building before it is removed. Almost 91% of the principals reported that any graffiti in their school is removed in less than a week. Five percent of the principals reported that graffiti is removed in more than one week but less than a month. Less than 1% of the principals responding to this question reported that graffiti removal occurs during summer maintenance or during the next painting cycle. Seven principals did not answer this question. A summary of the responses to question twenty-one are listed in Table 29.

Table 29

Time before Graffiti Removal

Time before graffiti removed	n	%
Until summer maintenance or the next painting cycle	1	0.5
More than a week, less than a month	11	5.4
Less than a week (or) no to all parts	186	90.7
Missing responses	7	3.4
Total	205	100.0

Cosmetic Conditions of Classrooms

Question twenty-two required the high school principals to rate the overall cosmetic condition of the classrooms in their respective buildings. Over 82% of the high school principals rated the cosmetic conditions of their classrooms as outstanding or satisfactory. Seventeen percent rated the cosmetic conditions of their classrooms as in need of improvement. One principal did not answer this question. Responses to question twenty-two are presented in Table 30.

Table 30

Cosmetic Conditions of Classrooms

Cosmetic conditions of classrooms	n	%
Needs improvement	35	17.1
Satisfactory	89	43.4
Outstanding	80	39.0
Missing responses	1	0.5
Total	205	100.0

Questions Related to High School Building Conditions

The high school building questions were determined through responses provided by the building principal or administrator in charge of the facilities. The principals responded to questions that addressed areas commonly associated with the overall condition if school buildings. These areas include the overall school maintenance; overall school condition and student enrollment. The responses that these Pennsylvania principals had to the questions concerning the overall conditions of their high schools are summarized in Table 31 to 33.

Overall School Maintenance

The twenty-third question asked the high school principals to rate the overall maintenance of their respective school buildings. The principals were asked to take into consideration general maintenance items such as light bulb replacement, electrical repairs, plumbing repairs, and general repair chores. Almost 89% of the high school principals rated the overall maintenance of their high school as either outstanding or satisfactory while 11% rated the overall maintenance of their high school as needing improvement. One principal did not answer this question. Table 31 lists the responses to question twenty-three.

Table 31

Overall School Maintenance

Overall school maintenance	n	%
Needs Improvement	23	11.2
Satisfactory	100	48.8
Outstanding	81	39.5
Missing responses	1	0.5
Total	205	100.0

Overall School Conditions

Question twenty-four asked the high school principals to rate the overall conditions of their school by taking into consideration all building, classrooms and technology characteristics. Over thirty-nine percent of the principals rated the overall condition of their respective high school as outstanding while an additional 39% of the principals rated the overall condition of their school as satisfactory. Approximately 21% of responding principals rated the overall conditions of their high school as in need of improvement. Table 32 lists the responses to question twenty-four.

Table 32

Overall School Conditions

Overall school conditions	n	%
Needs Improvement	43	21.0
Satisfactory	81	39.5
Outstanding	81	39.5
Missing	0	0.0
Total	205	100.0

Student Enrollment

Question twenty-five requested that the high school principals indicate the number of students enrolled, as of September 30th, 2005, in their respective buildings. The student enrollment of those high schools responding to this survey ranged from high schools that had enrollments of over 3500 students (1.0%) to high schools that had enrollments of between 500-999 students (40.5%). Two principals did not answer this question. Table 33 lists the responses to question 25.

Table 33

Student Enrollment

Student enrollment	n	%
Over 3500 students	2	1.0
3000-3499 students	3	1.5
2500-2999 students	5	2.4
2000-2499 students	13	6.3
1500-1999 students	26	12.7
1000-1499 students	71	34.6
500-999 students	83	40.5
Missing responses	2	1.0
Total	205	100.0

Data Analysis

A correlation analysis was performed to identify which building conditions; overall, structural and cosmetic; were significant and positively correlated to student academic achievement on the writing, reading and mathematics sections of the Pennsylvania System of School Achievement (PSSA). Correlations ranged from .14 to .18 ($p<.05$) between building conditions and student academic achievement on the PSSA exams. The results are reported in Table 34.

Overall Building Conditions and Academic Achievement in Writing

In order to analyze the data and identify the overall building condition predictors that have a significant influence on student academic achievement in writing, a step-wise multiple regression analysis was conducted. This analysis used as the dependent variable the three year average score obtained by 11th grade Pennsylvania high school students on the writing section of the Pennsylvania System of School Achievement (PSSA). Independent variables utilized in this analysis were the number of students enrolled in the high school; the age of the building; the number of windows in classrooms; building renovation/additions; the number of temporary classrooms; the type of flooring; interior and exterior painting; roof leaks; noise producing environment; the presence of electrical outlets in the classroom; classroom structural characteristics; the structural building condition rating; classroom heating system condition; classroom air conditioning system condition; floor cleaning frequency; ceiling material, type of classroom lighting; condition of classroom furniture; number and type of facilities located adjacent to the school; the presence and location of graffiti; graffiti removal; overall building maintenance; overall cosmetic classroom rating; overall building condition rating and the percentage of students

Table 34

Bivariate Correlation Analysis between Pennsylvania System of School Achievement (PSSA) Scores on Writing; Reading and Mathematics and High School Building Condition Ratings

Building Conditions	Academic Achievement		
	PSSA Writing 02-05	PSSA Reading 02-05	PSSA Math 02-05
Renovations	-.028	.178*	.184*
Temporary Classrooms	-.075	-.010	.003
Windows in classrooms	.054	.064	.021
Type of flooring	-.019	.029	.024
Interior Painting	-.126	.093	.036
Exterior Painting	.060	.132	.049
Roof Leaks	-.023	.039	.021
Noise Producing Environment	.089	.184	.142*
Electrical Outlets	-.064	-.206	-.132
Classroom Structural building rating	-.012	.042	.045
Structural conditions of building rating	.022	.183	.169*
Classroom heating	-.049	.096	.075
Classroom air conditioning	.019	.239	.226
Floor sweeping frequency	-.002	-.035	-.026
Facilities adjacent-soccer	.132	.194	.191
Facilities adjacent-basketball	-.059	-.041	-.016

* $p < .05$

Table 34 (Continued)

Bivariate Correlation Analysis between Pennsylvania System of School Achievement (PSSA) Scores on Writing; Reading and Mathematics and High School Building Condition Ratings

Building Conditions	Academic Achievement		
	PSSA Writing 02-05	PSSA Reading 02-05	PSSA Math 02-05
Facilities adjacent-baseball	.040	.168*	.159*
Facilities adjacent-swimming pool	.030	.199*	.212
Facilities adjacent- tennis	.037	.179*	.230
Facilities adjacent-football	.032	.090	.088
Ceiling type	-.024	.160*	.111
Classroom lighting	.120	.069	.095
Classroom furniture	-.010	.176*	.158*
Graffiti location-bathrooms	.095	.194	.152*
Graffiti location-lockers	.023	.127	.070
Graffiti location-hallways	.096	.175*	.159*
Graffiti location-classrooms	.075	.137*	.094
Graffiti location-exterior walls	.148*	.284	.219
Graffiti location- exterior walkways	.065	.139*	.104

* $p < .05$

Table 34 (Continued)

Bivariate Correlation Analysis between Pennsylvania System of School Achievement (PSSA) Scores on Writing; Reading and Mathematics and High School Building Condition Ratings

Building Conditions	Academic Achievement		
	PSSA Writing 02-05	PSSA Reading 02-05	PSSA Math 02-05
Graffiti location- other exterior surface	.014	.250	.221
Graffiti removal	.128	.053	.079
Overall cosmetic	.036	.269	.242
Overall maintenance	.022	.220	.208
Overall condition	.007	.245	.222
Student population	.019	.101	.032
School building age	.011	.107	.096
Student receiving free and reduced lunch 02-05	-.308	-.462	-.463

* $p < .05$

receiving free and reduced lunch served as a control variable and was also addressed in this study. The results of this analysis are presented in Table 35.

In the area of overall building conditions among high schools two variables, including the control variable free and reduced, was found to predict the difference in student academic achievement on the writing section of the PSSA. The independent variable, percentage of students receiving free and reduced lunch, produced the largest degree of variance at 9.8% on the writing exam, while the variable, interior painting, accounted for 1.9% of the variance on the writing exam. No other overall building condition variables were found to be significant predictors of student academic achievement in writing as measured by the PSSA.

Overall Building Conditions and Academic Achievement in Reading

In order to analyze the data and identify the overall building condition predictors that have a significant influence on student academic achievement in reading, a step-wise multiple regression analysis was conducted. This analysis used the three year average score obtained by 11th grade Pennsylvania high school students on the reading section of the Pennsylvania System of School Achievement (PSSA) as the dependent variable. Independent variables utilized in this analysis were the number of students enrolled in the high school; the age of the building; the number of windows in classrooms; building renovation/additions; the number of temporary classrooms; the type of flooring; interior and exterior painting; roof leaks; noise producing environment; the presence of electrical outlets in the classroom; classroom structural characteristics; the structural building condition; ceiling material, type of classroom lighting; condition of classroom furniture; floor cleaning frequency; number and type of facilities located adjacent to the school; the

Table 35

Step-Wise Multiple Regression for the Predictors of Overall Building Conditions and the Writing Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.313	.098	.093	.098	20.298	.000	-.318	-.084
2	Interior Painting	.342	.117	.017	.019	12.281	.000	-.137	-4.293

Note: $p < .05$: Independent variables entered: students enrolled; building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of flooring; interior and exterior painting; roof leaks; ceiling material; type of classroom lighting; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; condition of classroom furniture; classroom heating system condition; classroom air conditioning system condition; floor cleaning frequency; number and type of facilities located adjacent to the school; graffiti locations; graffiti removal; overall building maintenance; overall cosmetic classroom rating; overall building condition rating and percentage of students of free and reduced lunch.

presence and location of graffiti; graffiti removal; overall building maintenance; overall cosmetic classroom rating; classroom heating condition; classroom air conditioning condition; overall building condition rating and percentage of students receiving free and reduced lunch, served as a control variable and was also addressed in this study. The results of this analysis are presented in Table 36.

An analysis of overall building conditions among high schools identified five variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the reading section of the PSSA. The variable, percentage of students receiving free and reduced lunch accounted for the largest variance at 21.5% on the reading exam. Other underlying factors influencing the variance on the reading exam were the variables graffiti location-exterior walls, 4.2%; facilities adjacent to the building-swimming pool, 2.8%; graffiti location-classroom, 1.7%; and overall building cosmetic classroom rating, 1.5%. No other overall building condition variables were found to be significant predictors of student academic achievement in reading as measured by the PSSA.

Overall Building Conditions and Academic Achievement in Mathematics

To analyze the data and identify the overall building condition predictors that have a significant influence on student academic achievement in mathematics, a step-wise multiple regression analysis was conducted. This analysis used the three year average score obtained by 11th grade Pennsylvania high school students on the mathematics section of the Pennsylvania System of School Achievement (PSSA) as the dependent variable. The independent variables were the number of students enrolled in the high school; the age of the building; the number of windows in the classroom; building renovation/addition;

Table 36

Step-Wise Multiple Regression for the Predictors of Overall Building Conditions and the Reading Section of the Pennsylvania School System Assessment (PSSA).

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.463	.215	.210	.215	55.172	.000	-.365	-.140
2	Graffiti location- exterior walls	.507	.257	.249	.042	32.108	.000	.390	49.480
3	Facilities adjacent to building- swimming pool	.534	.285	.273	.028	24.567	.000	.161	2.252
4	Graffiti location- classroom	.549	.302	.287	.017	19.895	.000	-.262	-37.975
5	Overall cosmetic classroom condition	.563	.317	.299	.015	17.007	.000	.130	6.442

Note: $p < .05$: Independent variables entered: students enrolled; building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of flooring; interior painting; exterior painting; roof leaks; ceiling material; type of classroom lighting; noise producing environment; presence of electrical outlets in the classroom; condition of classroom furniture; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; floor cleaning frequency; type of facilities located adjacent to the school; graffiti locations; graffiti removal; overall building maintenance; overall cosmetic classroom rating; overall building condition rating and percentage of students of free and reduced lunch.

the number of temporary classrooms; the type of flooring; interior and exterior painting; roof leaks; noise producing environment; the presence of electrical outlets in the classroom; classroom structural characteristics; the structural building condition rating; classroom heating system condition; condition of classroom furniture; classroom air conditioning system condition; floor cleaning frequency; number and type of facilities located adjacent to the school; ceiling material; type of classroom lighting; the presence and location of graffiti; graffiti removal; overall building maintenance; overall cosmetic classroom rating; overall building condition rating and percentage of students receiving free and reduced lunch, served as a control variable and was also addressed in this study. The results of this analysis are presented in Table 37.

An analysis of overall building conditions among high schools identified three variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the mathematics section of the PSSA. The variable percentage of students receiving free and reduced lunch produced the largest variance at 20.9% on the mathematics exam, while the variables facilities adjacent to the school-swimming pool at 4.7%, and overall cosmetic classroom condition at 1.6% were identified as factors effecting mathematics achievement. No other overall building condition variables were found to be significant predictors of student academic achievement in mathematics as measured by the PSSA.

Cosmetic Building Conditions and Academic Achievement in Writing

A step-wise multiple regression analysis was conducted in order to analyze the data and identify those cosmetic building condition predictors that significantly influence

Table 37

Step-Wise Multiple Regression for the Predictors of Overall Building Conditions and the Mathematics Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.457	.209	.205	.209	49.405	.000	-.411	-.174
2	Facilities adjacent to the building-swimming pool	.506	.256	.248	.047	32.079	.000	.213	4.255
3	Overall cosmetic classroom condition	.522	.272	.261	.016	23.083	.000	.131	7.188

Note: $p < .05$: Independent variables entered: students enrolled; building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of flooring; interior painting; exterior painting; roof leaks; ceiling material; type of classroom lighting; noise producing environment; condition of classroom furniture; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; floor cleaning frequency; number and type of facilities located adjacent to the school; graffiti locations; graffiti removal; overall building maintenance; overall cosmetic classroom rating; overall building condition rating and percentage of students on free and reduced lunch.

student academic achievement in writing. For this analysis, the three year average score obtained by 11th grade Pennsylvania high school students on the writing section of the Pennsylvania System of School Achievement (PSSA) was used as the dependent variable. Independent variables utilized in this analysis were interior painting; exterior painting; the frequency of floor cleaning; cosmetic condition of classroom furniture; overall cosmetic condition of classrooms; the presence and location of graffiti; graffiti removal and percentage of students receiving free and reduced lunch, served as a control variable and was also addressed in this study. The results of this analysis are presented in Table 38.

An analysis of cosmetic building conditions among high schools identified two variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the writing section of the PSSA. The variable, percentage of students receiving free and reduced lunch, accounted for the largest variance at 9.5% on the writing exam; while the variable of interior painting, at 1.7%, was also found to be significant predictor on the writing exam. No other cosmetic building condition variables were found to be significant predictors of student academic achievement in writing as measured by the PSSA.

Cosmetic Building Conditions and Academic Achievement in Reading

A step-wise multiple regression analysis was conducted in order to analyze the data and identify those cosmetic building condition predictors that significantly influence student academic achievement in reading. For this analysis, the three year average score obtained by 11th grade Pennsylvania high school students on the reading section of the Pennsylvania System of School Achievement (PSSA) was used as the dependent variable. Independent variables utilized in this analysis were interior painting; exterior painting;

Table 38

Step-Wise Multiple Regression for the Predictors of Cosmetic Building Conditions and the Writing Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.308	.095	.090	.095	21.283	.000	-.310	-.081
2	Interior Painting	.335	.112	.103	.017	12.748	.000	-.131	-3.977

Note: $p < .05$. Independent variables: Interior painting; exterior painting; floor cleaning frequency; cosmetic condition of classroom furniture; overall cosmetic condition of classrooms; graffiti locations; graffiti removal; and percentage of students on free and reduced lunch.

the frequency of floor cleaning; cosmetic condition of classroom furniture; overall cosmetic condition of classrooms; the presence and location of graffiti; graffiti removal and percentage of students receiving free and reduced lunch, served as a control variable and were also addressed in this study. The results of this analysis are presented in Table 39.

An analysis of cosmetic building conditions among high schools identified four variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the reading section of the PSSA. The variable, percentage of students receiving free and reduced lunch, accounted for the largest variance, 21.4%, on the reading exam. The other variables identified as predictors of academic achievement in reading were graffiti location-exterior walls at 4.2%; graffiti location-classrooms at 1.9% and overall cosmetic classroom conditions at 1.7%. No other cosmetic building condition variables were found to be significant predictors of student academic achievement in reading as measured by the PSSA.

Cosmetic Building Conditions and Academic Achievement in Mathematics

A step-wise multiple regression analysis was conducted in order to analyze the data and identify those cosmetic building condition predictors that significantly influence student academic achievement. For this analysis, the three year average score obtained by 11th grade Pennsylvania high school students on the mathematics section of the Pennsylvania System of School Achievement (PSSA) was used as the dependent variable. Independent variables utilized in this analysis were the interior painting; exterior painting; the frequency of floor sweeping; cosmetic condition of classroom furniture; overall cosmetic condition of classrooms; the presence of graffiti; graffiti removal and

Table 39

Step-Wise Multiple Regression for the Predictors of Cosmetic Building Conditions and the Reading Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.462	.214	.210	.214	55.124	.000	-.371	-.141
2	Graffiti location-Exterior walls	.506	.255	.248	.042	34.648	.000	.429	55.058
3	Graffiti location-classroom	.524	.275	.264	.019	25.375	.000	-.278	-40.795
4	Overall Cosmetic classroom condition	.540	.292	.277	.017	20.585	.000	.136	6.513

Note: $p < .05$: Independent variables: interior painting; exterior painting; floor cleaning frequency; cosmetic condition of classroom furniture; overall cosmetic condition of classrooms; graffiti locations; graffiti removal and percentage of students on free and reduced lunch.

percentage of students receiving free and reduced lunch, served as a control variable and was also addressed in this study. The results of this analysis are presented in Table 40.

An analysis of the cosmetic building conditions among high schools identified two variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the mathematics section of the PSSA. The variable, students receiving free and reduced lunch, accounted for 21.4% of the variance on the mathematics exam, while the variable, graffiti location- exterior walls, accounted for 1.9% of the mathematics exam variance. No other cosmetic building condition variables were found to be significant predictors of student academic achievement as measured by the mathematics section of the PSSA.

Structural Building Conditions and Academic Achievement in Writing

A step-wise multiple regression analysis was conducted in order to analyze the data and identify those structural building condition predictors that significantly influence student academic achievement in writing. In this analysis the three year average score obtained by 11th grade Pennsylvania high school students on the writing section of the Pennsylvania System of School Achievement (PSSA) was used as the dependent variable. Independent variables utilized in this analysis were building age; windows in the classrooms; building renovation/additions; ceiling material; type of classroom lighting; temporary classrooms; type of flooring; roof leaks; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; number and type of facilities located adjacent to the school and

Table 40

Step-Wise Multiple Regression for the Predictors of Cosmetic Building Conditions and the Mathematics Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.463	.214	.210	.214	55.244	.000	-.437	-.183
2	Graffiti location-Exterior walls	.483	.233	.266	.019	30.718	.000	.141	20.001

Note: $p < .05$: Independent variables: interior painting; exterior painting; floor sweeping frequency; cosmetic condition of classroom furniture; overall cosmetic condition of classrooms; graffiti locations; graffiti removal; and percentage of students on free and reduced lunch.

percentage of students receiving free and reduced lunch, served as a control variable and were also addressed in this study. Table 41 identifies the results.

An analysis of structural building conditions among high schools identified only the predictor variable as a significant predictor of differences in student academic achievement on the writing section of PSSA. That variable, percentage of students receiving free and reduced lunch, accounted for 9.8% of variance on the writing exam. No other structural building conditions variables were found to be significant predictors of student academic achievement as measured by the writing section of the PSSA.

Structural Building Conditions and Academic Achievement in Reading

A step-wise multiple regression analysis was conducted to analyze the data and identify the best structural building condition predictors that influence student academic achievement. The three year average of Pennsylvania's high school student's reading academic achievement on the Pennsylvania System of School Achievement (PSSA) was used as the dependent variable. Independent variables utilized in this analysis were building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of flooring; roof leaks; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; ceiling material; type of classroom lighting; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; number and type of facilities located adjacent to the school and percentage of students receiving free and reduced lunch, served as a control variable and was also addressed in this study. The results of this analysis are identified in Table 42.

Table 41

Step-Wise Multiple Regression for the Predictors of Structural Building Conditions and the Writing Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.313	.098	.093	.098	20.298	.000	-.313	-.083

Note: $p < .05$: Independent variables: building age; windows in the classrooms; building renovation/additions; temporary classrooms; ceiling material; type of classroom lighting; type of classroom flooring; roof leaks; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; number and type of facilities located adjacent to the school and percentage of students on free and reduced lunch.

Table 42

Step-Wise Multiple Regression for the Predictors of Structural Building Conditions and the Reading Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.463	.215	.210	.215	51.120	.000	-.452	-.173
2	Facilities adjacent to the building-swimming pool	.504	.254	.246	.039	31.621	.000	.198	3.585

Note: $p < .05$: Independent variables: building age; windows in the classrooms; building renovation/additions; temporary classrooms; ceiling material; type of classroom lighting; type of classroom flooring; roof leaks; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; number and type of facilities located adjacent to the school and percentage of students on free and reduced lunch.

An analysis of structural building conditions among high schools identified two variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the reading section of the PSSA. The variable, percentage of student's receiving free and reduced lunch accounted for the largest variance on the reading exam at 21.5%. The other underlying factor influencing the variance on the reading exam was the variables of facilities adjacent to the building-swimming pool at 3.9%. No other structural building conditions variables were found to be significant predictors of student academic achievement in reading as measured by the PSSA.

Structural Building Conditions and Academic Achievement in Mathematics

In order to analyze the data and identify the best structural building condition predictors that influence student academic achievement in mathematics, a step-wise multiple regression analysis was conducted using the three year average of Pennsylvania's high school student's mathematics academic achievement on the Pennsylvania System of School Achievement (PSSA) as the dependent variable. Independent variables utilized in this analysis were building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of flooring; roof leaks; noise producing environment; presence of electrical outlets in the classroom; ceiling material, type of classroom lighting; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; number and type of facilities located adjacent to the school and percentage of students receiving free and reduced lunch, served as a control variable and was also addressed in this study. Table 43 identifies the results of this analysis.

Table 43

Step-Wise Multiple Regression for the Predictors of Structural Building Conditions and the Mathematics Section of the Pennsylvania School System Assessment (PSSA)

Step	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Free and reduced	.457	.209	.205	.209	49.405	.000	-.418	-.177
2	Facilities adjacent to the building-swimming pool	.506	.256	.248	.047	32.079	.000	.215	4.292
3	Renovations/ Additions	.522	.272	.260	.016	23.075	.000	.128	4.847

Note: $p < .05$: Independent variables: building age; windows in the classrooms; building renovation/additions; temporary classrooms; type of classroom flooring; ceiling material; type of classroom lighting; roof leaks; noise producing environment; presence of electrical outlets in the classroom; classroom structural characteristics; structural building condition rating; classroom heating system condition; classroom air conditioning system condition; number and type of facilities located adjacent to the school; and percentage of students on free and reduced lunch.

An analysis of structural building conditions among high schools identified three variables, including the control variable free and reduced, was found to predict the differences in student academic achievement on the mathematics section of the PSSA. The variable, percentage of students receiving free and reduced lunch, accounted for the largest variance on the mathematics exam at 20.9%. The other variables identified as predictors of academic achievement in mathematics were facilities adjacent to the building-swimming pool at 4.7% and building renovations/additions at 1.6% of the variance on the mathematics exam. No other structural building conditions variables were found to be significant predictors of student academic achievement in mathematics as measured by the PSSA.

Cosmetic and Structural Building Conditions and PSSA Academic Achievement

In order to identify the influence of cosmetic and structural building conditions on student academic achievement in reading, mathematics and writing, a step-wise multiple regression analysis was conducted using the three year average of Pennsylvania's high school student's reading, mathematics and writing academic achievement on the Pennsylvania System of School Achievement (PSSA) as the dependent variable. Independent variables utilized in this analysis were the high school's cosmetic and structural overall building condition ratings. Since the overall building condition rating correlated so highly with the cosmetic and structural ratings it was not used in this analysis. Table 44 explains the results of this analysis. Additionally, the percentage of students receiving free and reduced lunch served as a control variable and was also addressed in this study. Table 45 identifies the results of this analysis.

Table 44

Correlation Analysis between Cosmetic and Structural Building Conditions and PSSA Academic Achievement

Building Conditions	Academic Achievement		
	PSSA Math 02-05	PSSA Reading 02-05	PSSA Writing 02-05
Cosmetic Building Conditions	.216*	.272*	.027
Structural Building Conditions	.230*	.238*	.021
Student receiving free and reduced lunch 02-05	-.463	-.462	-.308

* $p < .05$

Table 45

Step-Wise Multiple Regression of the Cosmetic and Structural Building Conditions Ratings on the Mathematics; Reading and Writing Sections of the Pennsylvania School System Assessment (PSSA)

Step	*PSSA test*	*Variable Entered*	*R*	R^2	*Adjusted R squared*	*R Squared change*	*F*	*P*	Beta	*b*
1	Math	Free and reduced	.463	.214	.210	.214	55.250	.000	-.433	-.181
2	Math	Structural building conditions	.481	.231	.224	.017	30.384	.000	.135	1.065
1	Reading	Free and reduced	.462	.214	.210	.214	55.172	.000	-.418	-.158
2	Reading	Cosmetic building conditions	.483	.234	.226	.020	30.803	.000	.148	1.301
1	Writing	Free and reduced	.308	.095	.090	.095	21.292	.000	-.308	-.080

Note: $p < .05$: Independent variables: cosmetic building ratings; structural building rating and percentage of students on free and reduced lunch.

An analysis of cosmetic and structural building conditions among high schools identified that the following variables, including the predictor variable free and reduced, were significant predictors of differences in student academic achievement on the reading, mathematics and writing sections of the PSSA. On the PSSA reading exam the variable percentage of students receiving free and reduced lunch, accounted for 21.4% of the variance on the reading exam. The variable cosmetic building conditions accounted for 2.0% of the variance on the reading exam.

On the PSSA mathematics exam the variable, percentage of students receiving free and reduced lunch, accounted for the largest variance on the mathematics exam at 21.4%. The variable, structural building conditions, accounted for 1.7% of the variance on the mathematics exam.

An analysis of cosmetic and structural building conditions among high schools identified only one variable as a significant predictor of differences in student academic achievement on the writing section of PSSA. That variable, percentage of students receiving free and reduced lunch, accounted for 9.5% of variance on the writing exam. No other variables were found to be significant predictors of student academic achievement as measured by the writing section of the PSSA.

Summary

The findings of the responses from Pennsylvania high school principals on the modified Commonwealth Assessment of Physical Environment (CAPE) survey were summarized by a descriptive statistical analysis. A correlation analysis of building conditions and student academic achievement identified a positive relationship between variables associated with overall, structural or cosmetic building conditions and student academic achievement. Actually,

it was found that there was at least one variable from each building condition category, overall, structural and cosmetic, that correlated with student academic achievement.

Additionally, a step-wise multiple regression analysis was conducted and identified the variables that were predictors of the student academic achievement on the writing, reading and mathematics sections of the Pennsylvania System of School Assessment (PSSA). No single building condition variables were found to be predictors of student academic achievement in all areas of the PSSA test. However, it was noticed that facilities adjacent to the building and graffiti locations, although the facilities and locations differed in each analysis, were the most significant predictors of student academic achievement.

Chapter 5: Discussion, Conclusion, Implications for Practice and Recommendation for Future Studies

Chapter 5 includes an analysis and review of the findings from Chapter 4. A discussion of the impact that results from this study might have on educational practices as well as recommendations for future research and practices will also be addressed.

Discussion of High School Principals Responses

In order to acquire a more thorough understanding of the perception of school building conditions in Pennsylvania's high schools, an in-depth analysis of the high school principal's survey responses was conducted. This analysis of the data indicated that an overwhelming percentage, 79%, of high school principals who responded to the survey thought that the overall conditions of their buildings were satisfactory or outstanding. It was also noted that 82% of the responding high school principals thought the overall cosmetic conditions of their high school buildings were either satisfactory or outstanding. In addition, 81% of these high school principals rated the structural condition of their buildings as either satisfactory or outstanding. However, some areas of concern arose which did not seem to be in total agreement with the favorable responses principals made regarding the condition of their buildings.

In analyzing the data, one area that should be noted is the age of the high school buildings. Over 72% of the principals who responded to this survey indicated that their high school buildings were over 30 years of age. In fact, more than 56% of the high schools were reported to be over 40 years of age. As school buildings age and the physical conditions of these buildings begin deteriorating, school districts will be faced with the ever increasing challenge to provide appropriate maintenance. The instructional methods that will be utilized in the 21st

century will involve educational innovations that employ new tools, techniques and teaching modalities that will have great difficulty being accommodated in the school designs of buildings that are 30 years of age or older. At 30 plus years of age most school buildings should have undergone a major renovation where all the original equipment has been replaced (Honeyman and Sayles, 1995). Although 44% of respondents indicated their building had undergone a major renovation/addition within the past five years, the deterioration of these school buildings continues because of their age and the demands placed on them by educational programs that were never contemplated when the school buildings were designed and constructed. School systems across the Commonwealth of Pennsylvania will be faced with the unfortunate decision of whether to maintain these aging buildings, renovate the buildings, or invest millions of dollars in the replacement and construction of newer buildings.

Additional areas for concern revolved around the heating and air conditioning systems in the surveyed high schools. Over 61% of high school principals who responded reported difficulty in controlling the heat or air conditioning in their classrooms. Twenty percent of high school principals reported that they had no air conditioning in instructional spaces while 45% of the principals stated that they have air conditioning in instructional spaces, but it is not well regulated. Although it was not found to significantly influence student academic achievement, the difficulty in regulating the heating and air conditioning within a school building can present a problematic situation for many schools. If the temperature in a classroom is too hot or too cold it is difficult to imagine any student and/or teacher giving their undivided attention to a classroom activity when the classroom environment is physically uncomfortable. It would appear

reasonable to conclude that in order to provide an environment that encourages effective teaching and learning unnecessary distractions need to be removed or significantly minimized.

While 59% of respondents reported no visible signs of water damage or only a few water spots on the ceiling tiles, 41% stated that the ceilings in their buildings are deteriorating or developing new stains due to roof leaks. When roof leaks are not repaired they can cause serious structural and cosmetic damage to a school building, including damage to the ceiling tiles, the wall paint, the floors, the lockers, and the electrical equipment. In addition, roof leaks can also become a health concern for students if continued water damage promotes the development of mold. The negative impact that roof leaks can have on the educational programs of a school as well as on the health of its students requires that they must be addressed in an effective and timely manner. Maintaining the integrity of school building roofs is a priority for school divisions if they wish to preserve the structural and cosmetic condition of their buildings.

There seems to be an inconsistency between the respondents overwhelming satisfaction with the condition of their buildings and their unhappiness with specific building characteristics such as instructional space air conditioning, instructional space heating and the roof condition. When you include the fact that 56% of the high school buildings were 40 years of age or older, you wonder if this inconsistency occurred because the high school principals were reluctant to negatively evaluate their buildings. Nonetheless, respondents provided more detailed responses when asked questions concerning specific cosmetic or structural building characteristics.

Limitations

1. The building condition questionnaire in this study is designed to be a self-survey answered by the building principal and/or facilities administrator of the respective

building. Consequently, any results regarding school building conditions may be evaluated based on different building expectations and reflect personal biases on the part of the respondents.

2. This study was designed to examine school building conditions and their role in student academic achievement. Therefore, there is no in-depth investigation of other variables, such as testing conditions, curriculum testing, mother's educational background, building leadership or instructional strategies, which might have some correlation to academic achievement.
3. The CAPE survey had a response rate of 48%. Based on the response rate we do not know the opinions of the 52% of high school principals who did not respond. Therefore, the information that was collected could be biased towards an overall positive feeling about their high school building conditions.
4. Pennsylvania does not administer a state-wide assessment in social studies and science. As a result, any comparison to previous studies that incorporated social studies and science as part of their academic achievement scores should not be generalized.

Findings and Discussion of Analysis Results

A thorough examination of the nine step-wise multiple regression analyses performed in this study indicated that the following variables, including the control variable for socio-economic; the percentage of students participating in the free and reduced lunch program, to be negative and positive predictors of student academic achievement; facilities adjacent to the building- swimming pool; overall cosmetic classroom condition; graffiti location- exterior walls; graffiti location-classrooms; building renovations/additions; and interior painting cycle.

Finding #1-Participation in Free and Reduced Lunch

The percentage of students participating in the free and reduced price lunch program was the most significant predictor of student academic achievement. The control variable, the percentage of students participating in the free and reduced lunch program, was the most significant predictor of student academic achievement on the PSSA writing, reading and mathematics exams. In conducting the step-wise regression analyses, the percentage of students participating in the free and reduced lunch program was the first variable identified in each equation and accounted for the greatest percentage of variance on test scores obtained from the PSSA writing, reading and mathematics exams. When examining the overall building conditions, the cosmetic building conditions and the structural building conditions with the PSSA writing scores, free and reduced lunch participation explained 9.8% of the variance on this test. An additional analysis of the data indicated that for every percentage point increase in the number of students participating in the free and reduced lunch program, a high school's PSSA writing scores, when combined with overall building condition, cosmetic building condition and structural building conditions, declined by .08 points, on the scaled score.

In examining the overall building conditions category, the cosmetic building conditions category and the structural building conditions category with the PSSA reading scores, free and reduced lunch participation explained 21.5% of the variance on the test. Additional analyses of the data indicated that for every percentage point increase in the number of students participating in the free and reduced lunch program, the respective high school's PSSA reading score declined by .14 points, on the scaled score, when it was coupled with the overall building condition score. Using the same criteria as above, these additional analyses also indicated a decline of .14 points,

on the scaled score, on the PSSA reading exam when it was coupled with the cosmetic building conditions score and a decline of .17 points, on the scaled score, when it was analyzed with the structural building conditions category.

Finally, when analyzing the overall building conditions category, the cosmetic building conditions category and the structural building conditions category with the PSSA mathematics scores, free and reduced lunch participation explained 20.9% of the variance on the test. Additional investigation of the data indicated that for every additional percentage point increase in the number of students participating in the free and reduced lunch program, the respective high school's PSSA mathematics score declined by .17 points, on the scaled score, when it was linked with the overall building conditions category. Using the same criteria as above, these additional analyses indicated a decline of .18 points, on the scaled score, on the PSAA mathematics score when linked with the cosmetic building conditions category and a decline of .18 points, on the scaled score, on the PSSA mathematics score when analyzed with the structural building conditions category. In examining these data, the data showed that socio-economic conditions have less impact on student performance on the writing section of PSSA, than it does on the reading and mathematics sections of the PSSA.

Finding #2- Facilities Adjacent to the Building

There was a relationship between student achievement and buildings that have facilities adjacent to the building. In addition to the variable students participating in the free and reduced program, the variable facilities adjacent to the building had a significant influence on student academic achievement on the PSSA reading and mathematics exams. When examining the step-wise regression analysis the variable, facilities adjacent to the building-swimming pool, is

identified as having an influence on student academic achievement in four of the nine analyses conducted. In analyzing the overall building conditions category with the PSSA reading scores, facilities adjacent to the building -swimming pool accounted for 2.8 % of the variance on the PSSA reading test. A further examination of the data indicated that the high schools of the principals who responded affirmatively to the facilities adjacent to the building-swimming pool question had PSSA reading scores 2.3 points higher, on the scaled score. When analyzing the overall building conditions category with the PSSA mathematics scores, facilities adjacent to the building-swimming pool explained 4.7 % of the variance on the mathematics test. A further examination of the data indicated that the high schools of the principals who responded affirmatively to this survey question had PSSA mathematics scores 4.3 points higher, on the scaled score.

In analyzing the structural building conditions category with the PSSA mathematics scores, the variable facilities adjacent to the building- swimming pool accounted for 4.7 % of the variance on the test. A further examination of the data indicated that high school principals who responded affirmatively to this survey question had PSSA mathematics scores that were 4.3 points higher, on the scaled score. Finally, when analyzing the structural building conditions category with the PSSA reading scores, the variable facilities adjacent to the building-swimming pool accounted for 3.9% of the variance on the test. A further examination of the data indicated that high school principals who stated they had a swimming pool as part of their school facility had PSSA reading scores 3.6 points higher, on the scaled score.

Finding #3-Graffiti Location

There is a relationship between buildings that have graffiti on exterior walls and classrooms and student academic achievement. The variable graffiti location- exterior walls and classrooms; was identified has having a relationship with student academic achievement on the PSSA reading and mathematics exams. When examining the overall building conditions category and the cosmetic building conditions category with student performance on the PSSA reading and mathematics test, the variables graffiti location-exterior walls and graffiti location-classrooms were identified as having an effect on student academic achievement in three of the nine equations. In examining the overall building conditions category the variable graffiti location-exterior walls accounted for 4.2 % of the variance on the PSSA reading test, while the variable graffiti location- classrooms accounted for 1.7% of the variance on the PSSA reading test. A further examination of the data indicated that if a high school's principal response stated there was no graffiti on exterior walls the PSSA reading scores would be 49.5 points higher, on the scaled score, than those who responded they have with graffiti on their exterior wall. Additionally if the high school principal's response indicated a lack of graffiti in the classrooms would create a decrease of 37.9 points, on the scaled score, on the PSSA reading test.

When analyzing the cosmetic building conditions category high school principals who responded that there was no graffiti on the exterior walls of their school building had PSSA reading scores that were 55.0 points higher, on the scaled score, than the high schools with graffiti on their exterior walls. A further examination of the data indicated that when a high school principal's response indicated a lack of graffiti in the classrooms it would equate to a decrease of 40.7 points, on the scaled score, on the PSSA reading test. Additionally, when

analyzing the cosmetic building conditions category the variable graffiti location-exterior walls accounted for 1.9 % of the variance on the PSSA mathematics test. This analysis indicated that a change of the survey response to one stating a lack of graffiti on exterior walls would equate to an increase of 20.0 points, on the scaled score, on the scores of the PSSA mathematics test.

Finding #4- Interior Painting Cycle

There is a relationship between interior painting cycle and student achievement. Along with the variable students participating in the free and reduced lunch program, the variable interior painting was observed to have a relationship to student academic achievement on the PSSA writing exam. When analyzing the overall building conditions category and the cosmetic building conditions category, the frequency of interior painting accounted for 1.7 % of the variance on the PSSA writing test. Further analysis indicated that a survey response showing an increase in the time frame between painting cycles would equate to a decrease on the PSSA writing scores of 3.9 points, on the scaled score, when coupled with cosmetic building conditions category and 4.3 points, on the scaled score, when coupled with overall building conditions category.

Finding #5-Overall Cosmetic Classroom Rating

There is a relationship between overall cosmetic classroom rating and student academic achievement. In addition to student participation in the free and reduced lunch program, a significant relationship was identified between the overall cosmetic classroom rating score and student academic achievement on the PSSA reading and mathematics exams. When analyzing the overall building rating category, the overall cosmetic classroom rating score accounted for 1.6 % of the variance on the PSSA reading and 1.5% of the variance on the PSSA mathematics

tests. Additional examination of the data indicate that when a high school's principal's response for overall cosmetic classroom condition increases one level, from satisfactory to outstanding for example, student's PSSA reading scores were 6.4 points higher, on the scaled score, while the PSSA mathematics scores were 7.2 points higher, on the scaled score. Meanwhile, in an analysis of the cosmetic building conditions category, the overall cosmetic classroom rating accounted for 1.7 % of the variance on the PSSA reading exam. A further examination of the data indicate that when a high school's overall cosmetic classroom condition increases one level, the student PSSA reading scores were 6.5 points higher, on the scaled score.

Finding #6- Building Renovation/Addition

There is a relationship between building renovation/addition and student academic achievement. The variable building renovation/addition was identified to have a significant relationship between structural building conditions and student academic achievement on the PSSA mathematics exam. When analyzing the structural building conditions category, building renovation/addition accounted for 1.6 % of the variance on the PSSA mathematics test. An examination of the data indicated that a survey response which increases one level had student PSSA mathematics scores that were 4.8 points higher, on the scaled score.

Conclusion

The purpose of this study was to extend the research and to determine if a relationship exists between building conditions and student academic achievement in Pennsylvania's high schools. After a comprehensive analysis of the data, a relationship between: the interior painting cycle; the overall cosmetic classroom condition; the facilities adjacent to the building- swimming pool; the location of graffiti- classroom; the location of graffiti-exterior walls; building

renovations/additions and student academic achievement in Pennsylvania's high schools was identified. This relationship produced a wide variability in its impact on academic achievement. For example, high schools whose principals responded they had a swimming pool located adjacent to their building had Pennsylvania System of School Assessment (PSSA) mathematics scores 4.3 points higher than those who did not have a swimming pool. While high schools whose principals responded they have no graffiti on their exterior walls scored 55.0 points higher on the PSSA reading exam than those high schools who had graffiti on their exterior walls.

A relationship was also noted when comparing the cosmetic building condition; interior painting cycle to the PSSA writing exam. For example, an increase in the time frame between interior painting schedules produced a negative influence on the academic achievement level of students in the building. Additionally, building conditions such as facilities located adjacent to the building-swimming pool, which one would more likely find in areas that provide substantial financial support to the schools and the frequency of flooring cleaning, which requires far less financial support, were all associated with improved student academic achievement.

As the overall building conditions; the cosmetic building conditions or the structural building conditions in the high schools improved, there was a corresponding increase in the academic achievement of students of up to 55.0 points on the PSSA reading exam and up to 20.0 points on the PSSA mathematics exam. It did not matter if the improvement in a school buildings condition was cosmetic or structural; any improvement in the survey rating score was associated with an increase in student academic achievement. This would indicate that a relationship exists between student academic achievement and school building conditions in Pennsylvania high schools.

Comparison of Findings

The purpose of this study was to determine if a relationship exists between school building conditions and student academic achievement in Pennsylvania's high schools. Previous research studies conducted by Cash (1993), Earthman, Cash and Van Berkum (1996), Hines (1996), Lanham (1999) and Al-Enezi (2002) have investigated the relationship between school buildings conditions and student academic achievement in Virginia's high schools (Cash and Hines), Virginia's elementary schools (Lanham), in the North Dakota school system (Earthman, et. al) and in the Kuwaiti school system (Al-Enezi) and have established that a significant relationship exists in those localities.

As in the studies noted above, building conditions were analyzed based on the overall building condition, the cosmetic building condition and the structural condition of the building. Interestingly, just as was found in the Cash (1993), Hines (1996) and Al-Enezi (2002) studies, when cosmetic building conditions and structural building conditions in Pennsylvania's high schools were at the highest rating, student academic achievement increased between 3.6 points and 55.0 points. Those high schools that possessed more facilities adjacent to their building showed considerable higher student academic achievement scores on the PSSA examinations. Additionally, increased academic achievement was noted in high school buildings where there were more recent interior painting cycle and where there was an absence of graffiti in locations throughout the building. These results are in agreement with the results found by Cash (1993), Hines (1996), Earthman, Cash, Van Berkum (1996) and Al-Enezi (2002).

Unlike Cash (1993), Hines (1996), Earthman, et. al (1996) and Lanham (1999) who found air conditioning to be a significant factor in student academic achievement, air

conditioning was found to have no significant relationship with student academic achievement in Pennsylvania's high schools. This maybe explained by the different geographically location of Pennsylvania and Virginia. Additionally, building cleanliness, which was acknowledged as a factor that influenced student academic achievement in the Hines (1996) and Lanham (1999) studies, was found not to be a factor in this study.

Numerous studies have demonstrated a relationship between building conditions and student achievement in high school and elementary schools. In a time of increased academic expectations it is imperative that we thoroughly investigate all factors that have an influence on student academic achievement. Studies by Cash (1993), Hines (1996), Earthman, et. al (1996), Lanham (1999), and Al-Enezi (2002) have established that the condition of school buildings, where students spend the majority of their educational experience, does have an impact on their academic achievement level.

Implications for Practice

As school districts across the Commonwealth of Pennsylvania continue to focus on student accountability and improving student academic achievement, results from this study can be used to provide documentation for educational leaders, politicians and community members regarding the influence that building conditions have on the academic achievement of Pennsylvania high school students.

This study provides educational leaders with a wealth of information regarding the most advantageous way to utilize facility funds. It identifies those factors which have been shown to have a significant impact on student academic achievement. Principals and superintendents, using these factors as a template, could assess the condition of their school buildings and create a

prioritized list of potential changes to the facility. This prioritized list would provide school leaders with the building condition information necessary to make effective decisions that would impact the academic achievement of their students.

Educational leaders and policy makers must also focus on the declining condition of their school buildings when they are creating short-term and long-term budgetary and facility improvement plans. Results from this study could be used to bolster a school district's development of an overall plan concerning the importance of appropriating the funds necessary for present and future repair or renovation projects. Additionally, this study can also help support legislation that will be needed to provide adequate funding for present and future building projects.

Recommendations for Future Research

Using the CAPE as the building condition instrument, an investigation of the relationship between school building conditions and student achievement should be initiated at the middle school level. Previous studies have focused on the relationship between building conditions and student achievement at the elementary and high school levels. Middle school, which is the "bridge" between the elementary and high school years, is an ongoing concern to middle level educators. The academic variability often associated with this age group requires a more thorough understanding of all factors that impact their academic achievement. Therefore, in order to add to this body of knowledge it is imperative that we investigate the relationship between the condition of school facilities and the academic achievement of middle level students.

Update the high school studies in both urban and rural settings by analyzing the influence building conditions have on student achievement. This study would be advantageous in helping identify what role the local, state or federal government should play in the renovation, repair or construction of school facilities within the Commonwealth.

A study can be replicated that would investigate the relationship between school building condition and school leadership and teacher effectiveness. This study would analyze teacher's attitudes towards their school buildings and leadership in order to determine what influence these factors have on their ability to provide effective instruction in the classroom.

The current study could be replicated by categorizing high schools according to their individual districts and then comparing the building conditions and student academic achievement among these schools. Results of this research could be advantageous to local and state officials in identifying building characteristics and demographics of high performing schools throughout the Commonwealth of Pennsylvania.

It would be beneficial to identify high performing high schools in low socio-economic areas and survey the building administrators on their schools building conditions to see if there is a correlation with student academic achievement.

It would be advantageous to replicate this study using a smaller sample size and survey students, parents, building administrators, districts administrators on their perception of school building conditions. This would provide a more thorough investigation on the influence perceptions exert on student academic achievement.

Future researchers could conduct a more detailed study incorporating the utilization of technology, technology infrastructure and equipment to gain a better understanding of the role

technology has in student academic achievement. The increased emphasis on technology in and out of the classroom requires an in-depth study that can provide local, state and federal officials with valuable information concerning the impact technology has on student achievement.

Summary

The results from this study confirm that a relationship exists between the academic achievement of Pennsylvania high school students and the condition of their school buildings. This relationship was observed in the categories of cosmetic building conditions, structural building conditions and overall building conditions. Some of the specific building conditions found to have a relationship with academic achievement, as measured by the PSSA writing, reading and mathematics scores, were facilities adjacent to the building- swimming pool; overall cosmetic classroom condition; graffiti location- exterior walls; graffiti location-classrooms; building renovations/additions; and interior painting cycle.

The findings of this study are consistent with those obtained in previous research conducted on this topic, which has documented the existence of a relationship between academic achievement and building conditions on the elementary and high school level. Therefore, it would appear that the results from this study could be advantageous to school administrators in the Commonwealth of Pennsylvania as they investigate ways to improve the academic achievement of their students.

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Appendix A

The Revised Commonwealth Assessment of Physical Environment (CAPE)

Instructions: You are asked to indicate the status of your facility by circling the best response for each of the following questions. Please use your best judgment and experience as a building administrator. You may provide additional information in the space provided after each question.

1- What is the age of the school building? (Please base your answer on your best estimate of the time period during which most of the space used by your students was built)
   a. 60 years old or older
   b. 50-59 years old
   c. 40-49 years old
   d. 30-39 years old
   e. 20-29 years old
   f. 10-19 years old
   g. Under 10 years old

2- When was the last major renovation/addition to the school building completed? (if no major renovation have ever been done write none)
   a. 1980-1989
   b. 1990-1999
   c. 2000-Present

3- How many portable classrooms are utilized by your school?
   a. Over 15
   b. 11-15
   c. 6-10
   d. 1-5
   e. None

4- Are window in each instructional space (classroom)?
   a. Windows are in fewer that $1/4^{th}$ of the instructional spaces
   b. Windows are in at least $1/4^{th}$ of the instructional spaces
   c. Windows are in at least $3/4^{th}$ of the instructional spaces

5- What kind of flooring is found in the majority of the instructional spaces
   a. Wood floor
   b. Tile
   c. Terrazzo
   d. Carpet

6- 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

7- 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. Less than 4 years ago

8- Are there visible 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 new stains due to minor leaks
   c. No visible signs, or only a few old water spots in ceiling

9- Is the facility located near a busy, major highway, a 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 level of noise within the facility
   b. Yes, but measures have been taken to reduce the level of noise within the facility
   c. No

10- Which of the following best describes electrical service in the classroom?
   a. There is at least one outlet per wall in each classroom, or four or more outlets
   b. There are two or three outlets in each classroom
   c. There is one outlet in each classroom

11- Which of the following best describes the structural characteristics of the school's classrooms?
   a. Classrooms are self-contained spaces with a door that can be closed
   b. Classrooms are in modified open spaces using movable partitions or furniture to identify classroom boundaries
   c. Classes are held in open space areas shared with other classes

12- How would you rate the structural condition of the building?
   a. Needs improvement
   b. Satisfactory
   c. Outstanding

13- Which of the following best describes the heating system in the school?
   a. Uneven heat/unable to control in each room
   b. Even heat/unable to control each room
   c. Even heat/able to control each room

14- Which of the following best describes the air conditioning system in the school's instructional areas?
   a. No air conditioning in instructional spaces
   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

15- How often are the instructional area floors swept/mopped (if wood, tile, or terrazzo) or vacuumed (if carpet)?
   a. Monthly
   b. Weekly
   c. Daily or more frequently

16- Which of the following facilities are adjacent to, or part of, the school complex? (Please circle all that apply)
   a. Soccer field
   b. Outdoor Basketball court
   c. Baseball field
   d. Swimming pool
   e. Tennis courts
   f. Football field

17- What type of material is used for the majority of interior classroom ceilings?
   a. Wood
   b. Plaster or acoustical tiles in at lease 3/4ths of the instructional spaces
   c. Acoustical tile throughout the instructional spaces

18- What type of lighting is available in the instructional areas?
   a. Incandescent lighting
   b. Fluorescent lighting- Hot
   c. Fluorescent lighting- Cold

19- Which of the following best describes classroom furniture?
   a. Most rooms have furniture that is either facially scarred or functionally damaged
   b. Through at least half of the rooms may have some minor facial scars on student desks, all the furniture is functionally sound and looks satisfactory
   c. All classrooms have furniture which was functionally sound and facially attractive

20- Is graffiti commonly found on the premises? Circle yes or No for each listed area:

a. Bathroom	Yes	No
b. Lockers	Yes	No
c. Hallways	Yes	No
d. Classroom Walls/Doors	Yes	No
e. Exterior Walls	Yes	No
f. Exterior Walkways	Yes	No
g. Other Exterior surfaces	Yes	No

21- How long does the graffiti remain before it is removed?

a. until summer maintenance or the next painting cycle
b. more than a week, less than a month
c. less than a week (or) no to all parts of

22- How would you rate the overall cosmetic conditions in the classrooms?

a. Needs improvement
b. Satisfactory
c. Outstanding

23- How would you rate the overall maintenance of the school building? (When answering this question, consider such maintenance items as general repairs, light bulb replacement, the maintenance of plumbing, electrical and similar repairs, etc.)

a. Needs improvement
b. Satisfactory
c. Outstanding

24- How would you rate the overall condition of the school, taking into consideration all building, classroom, and technology characteristics?

a. Needs improvement
b. Satisfactory
c. Outstanding

25- As of September 30th, 2005, how many students were enrolled in your school?

a. Over 3500
b. 3000-3499
c. 2500-2999
d. 2000-2499
e. 1500-1999
f. 1000-1499
g. 500-999

Appendix B

Dear High School Principal:

My name is Sean O'Sullivan and I am an Assistant Principal at North Penn High School in Lansdale, Pennsylvania. I am also a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently engaged in conducting research for my doctoral dissertation. My research addresses the relationship between student academic achievement and building conditions in Pennsylvania's high schools. The academic achievement of students is a high priority for all educators, and it is therefore important that we identify all factors that might have an influence on the academic success of our students.

I am aware of your very busy schedule, but in order to successfully conduct this valuable research I need your assistance. I would request that you complete a very brief survey consisting of 25 multiple choice questions relating to the condition of your school building. This online survey should only take a few minutes and your responses will be strictly confidential. No high school will be identified by name in this research. When I have completed the study the results will be available to all participants on a website.

By clicking on the link below you will be directed to the online survey. When finished, please follow the directions for submitting your survey responses. If you wish not to participate in this research you are free to withdraw from participation.

Thank you in advance for your invaluable help with this project. If you have any additional questions, please e-mail me at osullis@npenn.org or call me at North Penn High School (215) 3687-9800 ext.416.

Sincerely,

Sean O'Sullivan

Appendix C

Dear High School Principal:

I recently sent you a request to participate in a study I am conducting on the relationship between student academic achievement and building conditions in Pennsylvania's high schools. Since, I have not had a response from you I am writing to request your participation in the research.

I am aware of your very busy schedule, but would request that you complete a very brief survey consisting of 25 multiple choice questions relating to the condition of your school building. This online survey should only take a few minutes and your responses will be strictly confidential. No high school will be identified by name in this research. When I have completed the study the results will be available to all participants on a website.

By clicking on the link below you will be directed to the online survey. When finished, please follow the directions for submitting your survey responses.

Thank you in advance for your invaluable help with this project. If you have any additional questions, please e-mail me at osullis@npenn.org or call me at North Penn High School (215) 3687-9800 ext.416.

Sincerely,

Sean O'Sullivan

Appendix D

Dear :

My name is Sean O'Sullivan, and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently engaged in conducting research for my doctoral dissertation which will study the relationship between student academic achievement and building conditions in Pennsylvania's high schools. This study will build upon your research on this topic and expand the geographical scope of previous studies. The title of my study is: "The study of the relationship between building conditions and student academic achievement in Pennsylvania's high schools."

I would appreciate your permission to reprint in my dissertation excerpts from your unpublished dissertation; " ." The excerpt to be reproduced is will be

If you have any questions regarding this request, or even better, any suggestions regarding the study, please contact me at the address listed below. Once again, thank you for any assistance you may be able to provide in this endeavor.

Sincerely,

Sean O'Sullivan

Mr. Sean O'Sullivan
302 Wartman Road
Collegeville, PA. 19426
Home Tel. #: 610-489-2956
Work Tel #: 215-368-9800 ext 416
E-mail: osullis@npenn.org

Appendix E

Dear Dr. Cash:

My name is Sean O'Sullivan, and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently engaged in conducting research for my doctoral dissertation which will study the relationship between student academic achievement and building conditions in Pennsylvania's high schools. This study will build upon your research on this topic and expand the geographical scope of previous studies. The title of my study is: "The study of the relationship between building conditions and student academic achievement in Pennsylvania's high schools."

An integral part of this study is to have high school administrators across the Commonwealth of Pennsylvania rate the conditions of their school buildings through the use of a survey. I feel that the appropriate instrument for that purpose is your Commonwealth Assessment of Physical Environment. This is the survey form used in your unpublished dissertation: "Building Conditions and Student Achievement in Virginia's high schools." I would appreciate your permission to use questions from this survey form, which are applicable to Pennsylvania's high schools, as part of my assessment of the building conditions in the targeted high schools.

If you have any questions regarding this request, or even better, any suggestions regarding the study, please contact me at the address listed below. Once again, thank you for any assistance you may be able to provide in this endeavor.

Sincerely,

Sean O'Sullivan

Mr. Sean O'Sullivan
302 Wartman Road
Collegeville, PA. 19426
Home Tel. #: 610-489-2956
Work Tel #: 215-368-9800 ext 416
E-mail: osullis@npenn.org

Appendix F

Dr. Al-Enezi-

My name is Sean O'Sullivan, and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently engaged in conducting research for my doctoral dissertation which will study the relationship between student academic achievement and building conditions in Pennsylvania's high schools. This study will build upon your research on this topic and expand the geographical scope of previous studies. The title of my study is: "The study of the relationship between building conditions and student academic achievement in Pennsylvania's high schools."

An integral part of this study is establishing a theoretical model in which identifies the antecedents that influence student academic achievement. I feel that the appropriate instrument for that purpose is your theoretical model used in your unpublished dissertation: " The study of the relationship between school building conditions and academic achievement of twelfth grade students in Kuwaiti public high schools." I would appreciate your permission to use your theoretical model, as part of my identification of factors that influence student academic achievement.

If you have any questions regarding this request, or even better, any suggestions regarding the study, please contact me at the address listed below. Once again, thank you for any assistance you may be able to provide in this endeavor.

Sincerely,

Sean O'Sullivan

Appendix G

Dear Dr. Lemasters:

My name is Sean O'Sullivan and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. In the course of my studies I became intrigued with your research on the relationship between building conditions, student achievement and student behavior. As a middle school administrator for the past six years, I wondered how building conditions might affect my students.

I am currently engaged in prospectus phase of my dissertation which I will submit for approval by the university. Hopefully, the concept will be accepted which will allow me to begin collecting data on this topic. I would appreciate your permission to include information from your dissertation; "A synthesis of studies pertaining to facilities, student achievement and student behavior." If formal approval for my topic is granted I will then ask your permission to use other pertinent items from your study in my dissertation. I hope that my efforts will add to the strong foundation you have created regarding the relationship of building conditions and student achievement.

If you have any questions, or even better, any suggestions, you can contact me at the address listed below. Thank you for any assistance you may be able to provide me in this endeavor.

Sincerely,

Sean O'Sullivan

Appendix H

Dear Dr. Lanham:

My name is Sean O'Sullivan and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. In the course of my studies I became intrigued with your research on the relationship between building conditions and student achievement. As a middle school administrator for the past six years, I wondered how building conditions might affect my students.

I am currently engaged in prospectus phase of my dissertation which I will submit for approval by the university. Hopefully, the concept will be accepted which will allow me to begin collecting data on this topic. I would appreciate your permission to include information from your dissertation; "Relating Building Conditions and Classroom conditions to Student Achievement in Virginia's Elementary schools." If formal approval for my topic is granted I will then ask your permission to use other pertinent items from your study in my dissertation. I hope that my efforts will add to the strong foundation you have created regarding the relationship of building conditions and student achievement.

If you have any questions, or even better, any suggestions, you can contact me at the address listed below. Thank you for any assistance you may be able to provide me in this endeavor.

Sincerely,

Sean O'Sullivan

Appendix I

Dr. Earthman-

My name is Sean O'Sullivan, and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently engaged in conducting research for my doctoral dissertation which will study the relationship between student academic achievement and building conditions in Pennsylvania's high schools. This study will build upon your research on this topic and expand the geographical scope of previous studies. The title of my study is: "The study of the relationship between building conditions and student academic achievement in Pennsylvania's high schools."

An integral part of this study is to review previous research conducted and examine if any relationships exists. I would appreciate your permission to use the findings from your state-wide study of North Dakota's high schools research conducted with Dr. Cash and Mr. Van Berkum, as part of my literature review.

If you have any questions regarding this request, or even better, any suggestions regarding the study, please contact me at the address listed below. Once again, thank you for any assistance you may be able to provide in this endeavor.

Sincerely,

Sean O'Sullivan

Appendix J

Dr. Phillips-

My name is Sean O'Sullivan, and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently conducting research for my doctoral dissertation which will study the relationship between student academic achievement and building conditions in Pennsylvania's high school. This study will build upon your research on this topic and expand the geographical scope of previous studies.

The title of my study is: "The study of the relationship between building conditions and student academic achievement in Pennsylvania's high schools." I would appreciate your permission to reprint in my dissertation excerpts from your unpublished dissertation; "Educational facility age and the academic achievement and attendance of upper elementary students." The excerpt to be reproduced is your chart: A Comparison of the Iowa Test of Basic Skills (ITBS) Mean Scores on Reading and Mathematics among Third, Fourth and Fifth Grade Students at Three different Elementary Schools.

If you have any questions regarding this request, or even better, any suggestions regarding the study, please contact me via email or at the address listed below. Once again, thank you for any assistance you may be able to provide in this endeavor.

Sincerely,

Sean O'Sullivan

Appendix K

Dr. Hines-

My name is Sean O'Sullivan, and I am a doctoral candidate in the educational leadership program at Virginia Polytechnic Institute and State University. I am presently engaged in conducting research for my doctoral dissertation which will study the relationship between student academic achievement and building conditions in Pennsylvania's high school. This study will build upon your research on this topic and expand the geographical scope of previous studies. The title of my study is: "The study of the relationship between building conditions and student academic achievement in Pennsylvania's high schools."

I would appreciate your permission to reprint in my dissertation excerpts from Building Conditions and Student Achievement and Behavior. The excerpt to be reproduced is your chart: A Comparison of Overall Building Conditions, Structural Building Conditions and Cosmetic Building Conditions with Percentile Ranks on Subtests of the Test of Academic Proficiency (TAP) for Grade 11 during the 1993-1993 school year.

If you have any questions regarding this request, or even better, any suggestions regarding the study, please contact me at the address listed below. Once again, thank you for any assistance you may be able to provide in this endeavor.

Sincerely,

Sean O'Sullivan

Appendix L

MEMORANDUM

TO:
Travis W. Twiford
Sean O'Sullivan
FROM: David M. Moore

SUBJECT:
IRB Exempt Approval: “A Study Of The Relationship Between Building Conditions And Student Academic Achievement In Pennsylvania’s High Schools” , IRB # 06-375

I have reviewed your request to the IRB for post facto exemption for the above referenced project. I concur that the research falls within the exempt status. Post facto approval is granted effective as of June 30, 2006.

cc: File
V I R G I N I A P O L Y T E C H N I C I N S T I T U T E U N I V E R S I T Y A N D S T A T E U N I V E R S I T Y

(Certifier's identity unknown) Signed by Brandi Evans Time: 2006.06.30 16:18:54 -04'00'
Reason: I attest to the accuracy and integrity of this document

Vita

Sean O'Sullivan

Email- seano@vt.edu

Education

B.A. 1992	University of Delaware Major: History
M. Ed, 2000	Virginia Polytechnic Institute and State University Major: Educational Leadership and Policy Studies
Ed. D, Fall, 2006	Virginia Polytechnic Institute and State University Major: Educational Leadership and Policy Studies

Experiences

Assistant Principal 2005-Present	North Penn School District Lansdale, PA
Assistant Principal 2002-2005	Loudoun County Public Schools Leesburg, VA
Assistant Principal 2000-2002	Fairfax County Public Schools Fairfax, VA
Department Chairperson/ 1997-2000 Social Studies Teacher	Fairfax County Public Schools Fairfax, VA

Memberships

Association for Curriculum and Development	Fall 1997- Present
Phi Delta Kappa	Winter 2000-Present
Council for Educational Facility Planners	Spring 2003- Present