A STUDY OF THE RELATIONSHIP BETWEEN SCHOOL BUILDING CONDITIONS AND ACADEMIC ACHIEVEMENT OF TWELFTH GRADE STUDENTS IN KUWAITI PUBLIC HIGH SCHOOLS

by

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ABSTRACT

This study explored the relationship between school building conditions and the academic achievement of twelfth students in selected public high schools in Kuwait. The population of the study was 56 high schools (28 boys' schools and 28 girls' schools) that offered a Sciences and Arts majors. The major research questions in this study were: (a) is there a relationship between overall, cosmetic, and structural conditions and student achievement; (b) does the relationship between building condition and student achievement differ between boys' and the girls' schools; and (c) what aspects of physical building components are related to student achievement. The high school principals were given the revised Commonwealth Assessment of Physical Environment (CAPE) to assess building conditions. Student achievement was measured by final examination scores collected from the Information Center at the Ministry of Education.

Pearson r, was used to determine if there is a relationship between building conditions and student achievement. This analysis revealed that a positive significant relationship exists between student achievement scores and building conditions in the boys' schools. The results of two-way ANOVA and the t-test, used sequentially to compare academic achievement in the top and bottom quartiles, found that building conditions affect significantly the achievement of students in the Sciences major. The t-test highlighted significant differences in subjects in the Sciences major among only the boys' schools.

Multiple regression, used to explain the variance in student achievement, indicated that building conditions explain at least 77% of the variance of Sciences majors' achievement, but did not account for any Arts majors' achievement. Because the SES index was neither available nor introduced into a formula, this resulted in a heavier weighting given to the remaining variables. The building conditions of the girls' schools did not explain student achievement in either the Sciences or the Arts majors. Step-wise multiple regression, used to determine which physical aspects of a building's condition best predict student achievement, indicated that graffiti and roof leaks are the main predictors of achievement.

Six conclusions were drawn from this study: (a) a significant positive relationship was found between the overall, structural, and cosmetic building condition and student achievement in the Sciences major when all 56 school buildings were analyzed; (b) a significant positive relationship was found between the overall and structural building condition and student achievement in the Arts major when all 56 school buildings were analyzed; (c) a significant relationship was found between building conditions and academic achievement in boy's schools in the Sciences major; (d) building conditions had a lesser impact on academic achievement in the boys' schools in the Arts major; (e) in the girls' schools, building conditions did not affect academic achievement in either the Sciences major or Arts major; and (f) graffiti and roof leaks were the main predictors of physical aspects of a building's condition that accounted for student achievement.

This study then underscores the need for the Kuwaiti Ministry of Education to establish policy supporting a program of improved facilities for all new schools. More research is needed to extend the breath of findings regarding the relationship between building conditions and student academic achievement. This study should be replicated in other non-U.S. countries.

DEDICATION

This dissertation is dedicated to my family who gave me continuous support in this endeavor. To my wife and my sons, Talal, Salman, and Ibraheem whom I am forever grateful for their love, patience, and sacrifice. This dissertation is also dedicated to my mother who has instilled in me the importance of education and the determination to pursue my goals. Finally, this dissertation is dedicated to everyone who helped me and offered a constant support and absolute belief in me.

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CHAPTER 1: CONTEXT OF THE STUDY

One acquires an education in order to ensure a smooth and flexible transition to an independent, self-sufficient life. Although some people seek their formal education outside the traditional classroom (e.g., private tutoring, home schooling), the customary educational institution is the school. 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. The context for this study assumes that the design, maintenance, and operation of schools and other educational institutions must be taken into account as factors that contribute to a positive learning environment for students and working environment for the faculty and staff (Christopher, 1988).

According to Cash (1993), a school "is a promise of the future. Schools should reflect the environment of success. . . . It is a physical representation of a public message about the value of education" (p. 83). Winston Churchill said, "We shape our buildings; therefore, our buildings shape us" (as cited in Gardner, 1981, p. 7). These comments suggest that the school environment may be just as important as the choice of methods and curriculum to ensuring a positive outcome. Creating an effective school entails designing the facility specifically as an educational environment, which is a complicated issue. A well-designed building will support its users (Birch & Johnstone, 1975; Knirk, 1993) by addressing a broad spectrum of issues that include occupant-related issues, such as creating a physically comfortable environment with adequate lighting, temperature and noise control, technology and equipment, and personal user access needs. These features address the requirements of the users of a particular space so that the classrooms work well for both teachers and students.

A well-planned facility will be able to accommodate changes in use (e.g., class size, technology upgrades, and perhaps flexible-use rooms), be easy to maintain and upgrade, be energy efficient, and address the safety concerns of the occupants (Galluzzo & Bar, 1999; Sydoriak, 1993).The custodial staff needs to be trained to maintain and operate the facility, and costs associated with this need to be included in the costs budgeted for operating the building.

Hathaway (1991) asserted that children perceive that their schools reflect important things related to their communities and also believe that good schools help them to make good transitions to life in the community. Until recently, professionals involved in school design have assumed that as long as certain minimum standards for size, acoustics, lighting, and temperature were met, a productive environment existed and teaching and learning would proceed normally (Conners, 1982). However, more recent research has determined that the physical environment and the learning experience cannot be separated and are considered to be integral parts of each other (Taylor & Gousie, 1988).

Prior to this awareness of the relationship between the school environment and student learning, it was felt that the environment only affected the consciousness when it caused particular pleasure, harm, discomfort, or stress. Now increasing evidence argues that an improperly designed physical environment in a school may cause stress to the occupants of the facility, both directly and indirectly (Conners, 1982). Edwards (1991) confirmed the idea that student achievement can be influenced by the school condition and environment. Thus, the trend is moving to where educators and facility planners are considering other dimensions or factors in a school's physical environment that have an influence on those involved – teachers and students – in the educational process (Conners, 1982).

One common topic in school facility planning concerns the relationships between school building conditions and student achievement, and student behavior (Earthman & Lemasters, 2000). Although both the physical environment and the building conditions have been documented as having an impact on student achievement and behavior, there have been relatively few studies that examine this issue in great detail (Earthman, 1985; Faust, 1980). Several studies (Bowers & Burkett, 1987; Cash, 1993; Cervantes, 1999; Earthman, Cash, & Van Berkum, 1996; Edwards, 1991; Hines, 1996; Lanham, 1999) have examined the relationship between school building conditions and student achievement, and have confirmed that the two concepts are related to each other.

Because Kuwait has demonstrated a commitment to improving and enhancing its educational facilities, as well as to ensuring the successful education of its students, this study contributes to this effort by investigating how the school facility affects the educational outcome of the twelfth graders in Kuwaiti public high schools.

Theoretical Model

The relationship of school building conditions and student achievement is complicated. There are several variables that might affect the quality of building conditions and student achievement. Based on previous research studies, Cash (1993) designed a theoretical model showing some possible factors that affect the building condition and, in turn, affect student achievement and behavior (Figure 1).

As shown in Figure 1, Cash stated that leadership and financial ability have an influence on maintenance and custodial staff, which in turn, have a corresponding effect on school building conditions. Moreover, she stated that school building conditions influence the attitudes

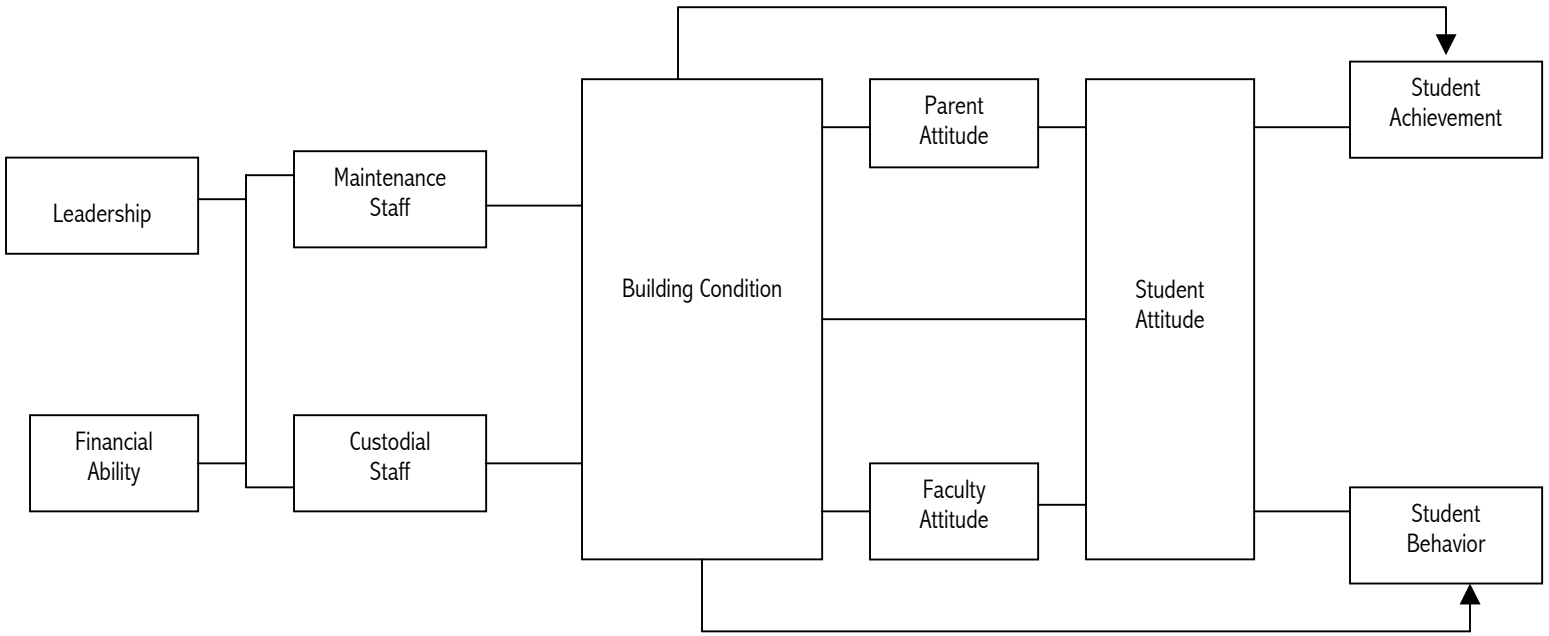

Figure 1. Cash's Model: The direct and indirect relationship between building condition and student achievement. Source: "Building Condition and Student Achievement and Behavior" (Cash, 1993, p. 4).

of students, parents, and faculty. The attitudes of the parents and teachers, particularly, influence students' perception of the building. This can affect both the academic achievement and the behavior of students. Consequently, the condition of the school building, which is the result of administrative action and financial ability, influences the academic performance and behavior of students. This relationship between building conditions and student achievement has been linked to various components of the building, such as temperature control and ventilation, adequate lighting suited to the use of the space (e.g., incandescent, hot-white fluorescent, cool-white fluorescent, and full-spectrum), and wall color (e.g., white, pastel, or dark tones).

Lemasters (1997) and Lanham (1999) both refines Cash's model. Lemasters' model (Figure 2) is based on her research findings from reviewing research studies conducted from 1980 to 1996. She categorized building conditions into cosmetic conditions and structural conditions, based on the findings of Cash (1993) and Hines (1996). Lanham's Model (Figure 3), which is based on his research literature review, elaborates and further refines Cash's and Lemasters' models. He believed that administrative decisions, funding priorities, and deferred maintenance are the antecedents to building and classroom conditions and that student achievement might be influenced indirectly through the their attitudes and behaviors (Figure 3).

The theoretical model for this study (Figure 4) combines Cash's (1993), Lemasters' (1997), and Lanham's (1999) models, but with some differences in the identification

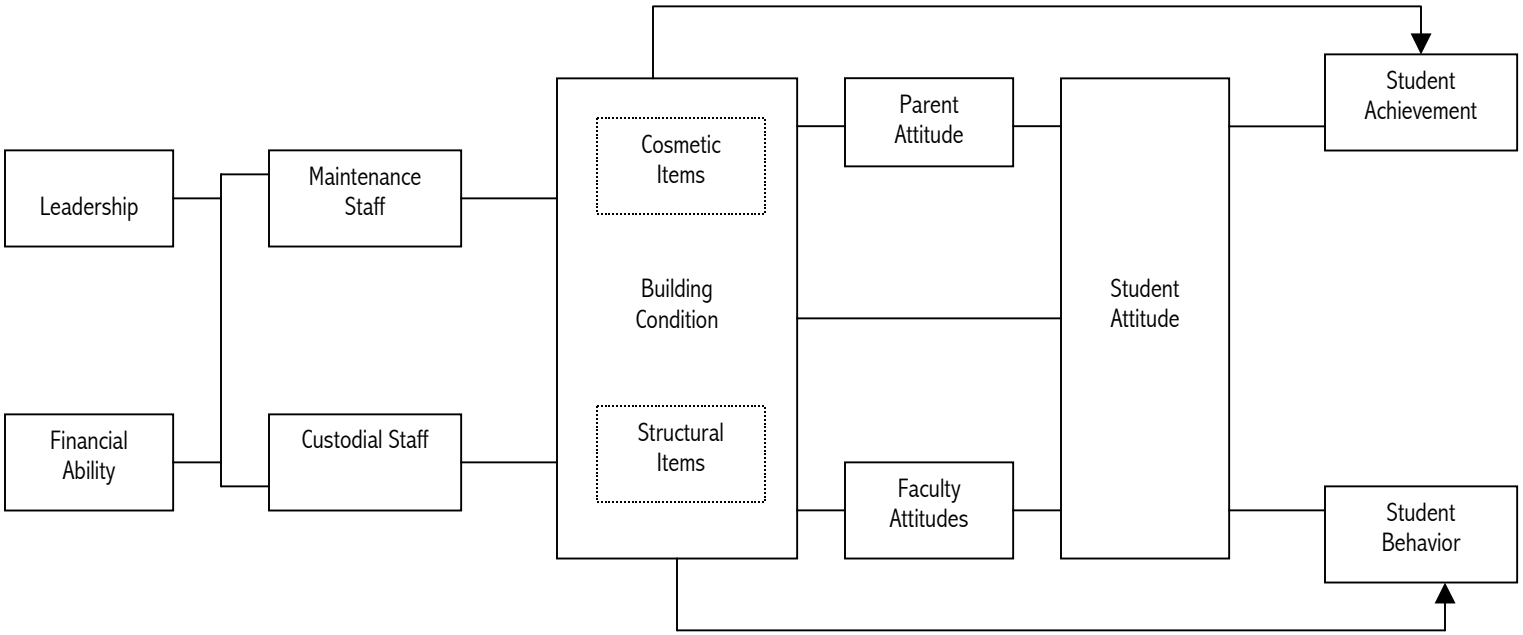

Figure 2. Lemasters' Model: The direct and indirect relationship between building condition and student achievement. Source: "A synthesis of studies pertaining to facilities, student achievement, and student behavior" (Lemasters, 1997, p. 211).

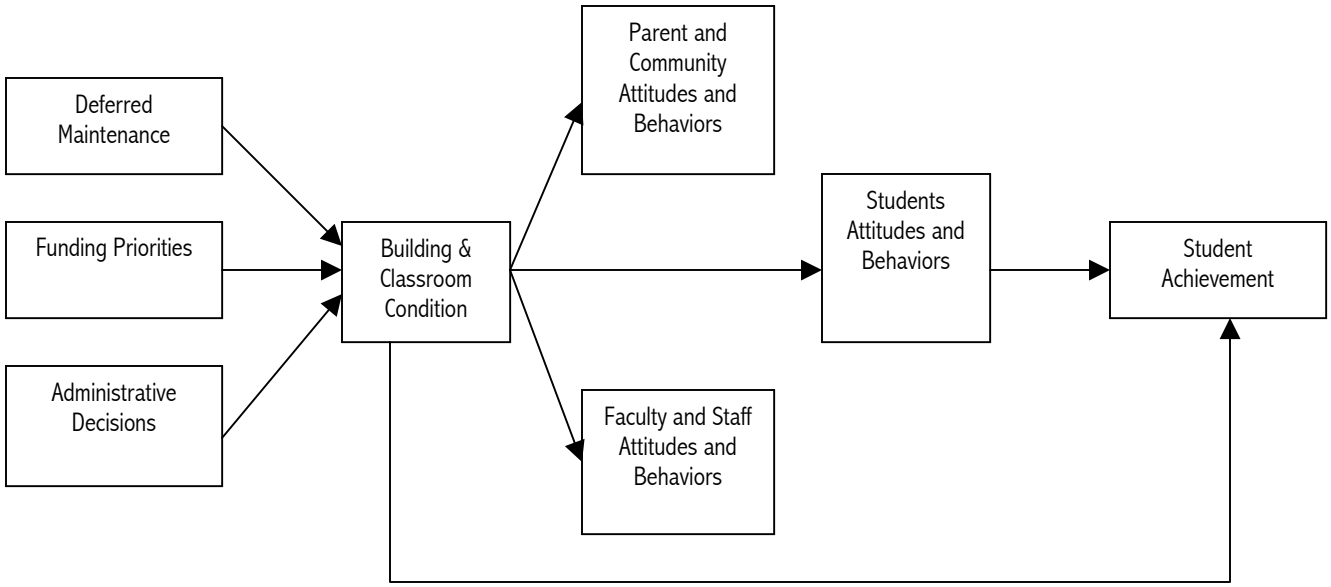

Figure 3. Lanham's Model: The relationship between building condition and student achievement. Source: "Relating building and classroom conditions to student achievement in Virginia's elementary schools" (Lanham, 1999, p. 7).

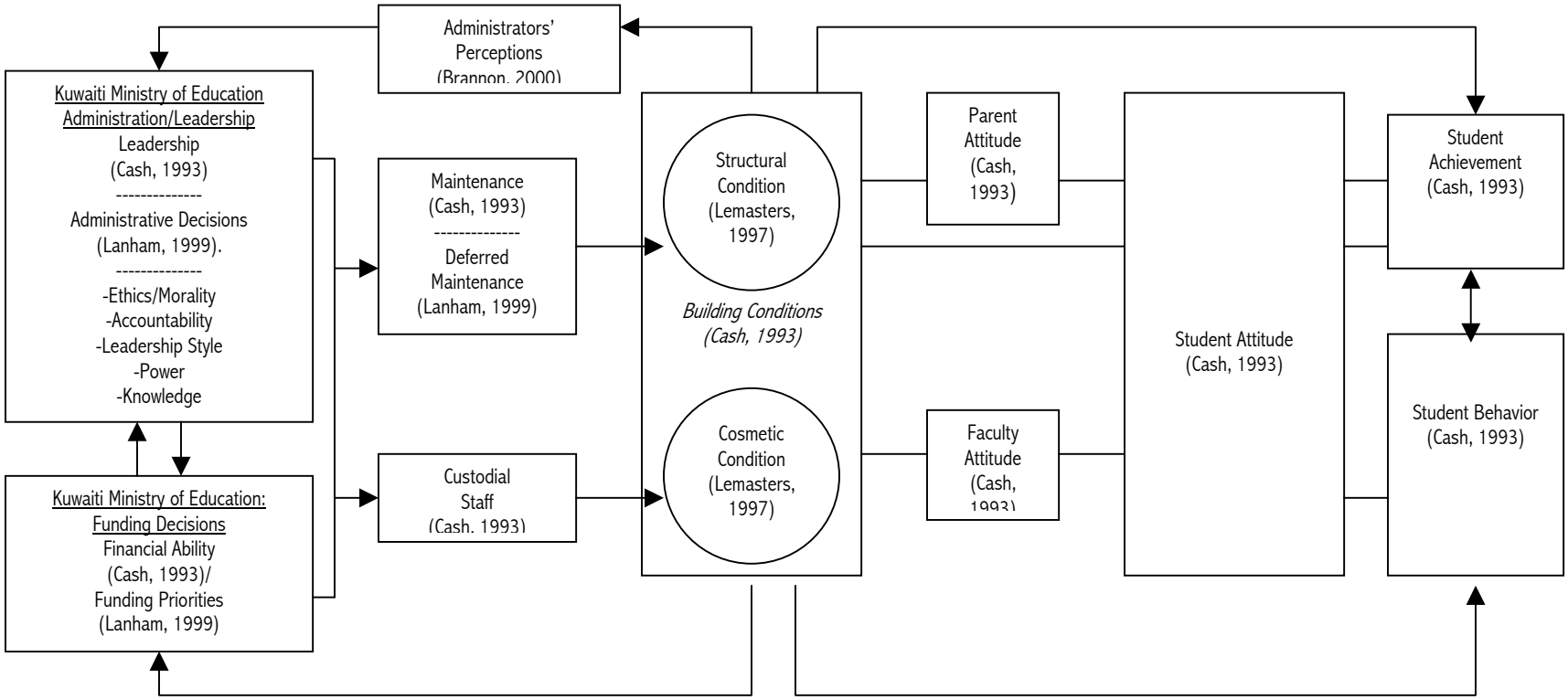

Figure 4. Revised Theoretical Model: Factors affecting the relationship between building condition and student achievement. Adapted from "Relating building and classroom conditions to student achievement in Virginia's elementary schools" (Lanham, 1999, p. 7), "A synthesis of studies pertaining to facilities, student achievement, and student behavior" (Lemasters, 1997, p. 211), and "Building Condition and Student Achievement and Behavior" (Cash, 1993, p. 4).

of the antecedents to the quality of school building conditions to reflect the location of the study. However, the relationship between the condition of a building and student achievement and behavior for this study corresponds to the explanations in Cash's model. In the model for this research, six antecedents are the variables contributing to the quality of school building conditions.

The first variable is administrators' perceptions regarding building conditions and the priorities they assign to building features, because these are key factors contributing to their willingness to address building conditions. The second variable is the ability of various levels of administration within the Kuwaiti government – in the Ministry of Education and other departments – to establish and support effective and appropriate administrative policies regarding school building conditions. In order to emphasize the high priority placed on the quality of education and the facilities and equipment involved in the process, administrators need to make choices and exhibit leadership to ensure appropriate facility conditions and features.

The third variable is making optimal government policies and decisions in Kuwait concerning the physical plant because these require a clear understanding of building conditions and how they affect the population using the facility. The most appropriate decisions are possible when administrators are committed to accountability and responsibility as part of their educational values and philosophies.

The fourth variable is funding; the ability of the administration to finance both ongoing maintenance and upgrades is largely determined by administrative decisions. This means that administrative decisions can limit the financial ability of the school to address or defer specific building maintenance projects.

The fifth and sixth variables, maintenance and custodial staff, also affect school building conditions. Those two variables are predetermined by administrative decisions and the financial situation that determines funding priorities. The degree to which the administrators fund and staff the maintenance and operation department will determine the condition of the school facility. Inadequate custodial performance or insufficient custodial personnel might lead to unclean or poorly maintained buildings. The necessity of providing adequate and quality maintenance services for schools is determined by the Kuwaiti Ministry of Education as a result of evaluation of school buildings. An insufficient headcount may mean that the school does not have the personnel or skills required to maintain the facilities. Inadequate training also may render the staff unable to properly maintain the building, causing necessary repairs to be either deferred or done improperly. Realistically, non-emergency maintenance can also be re-scheduled to address more urgent needs, while taking into account preventative maintenance to prevent sudden system failure.

The facility needs attention and upkeep long after the first day the doors are opened to students. In Kuwait, the budget for this maintenance depends on the funding priorities assigned by the Department of Maintenance and Operation within the Kuwaiti Ministry of Education. This department determines the funding for addressing ongoing and periodic maintenance and facility upgrading issues. Although each school has an internal budget assigned by the Kuwaiti Ministry of Education, this account is used for discretionary expenses involved in routine maintenance and upkeep, not large remodeling projects or capital improvements. Obviously, administrative decisions regarding budgeting for major projects, such as renovation or remodeling, are made by the Ministry of Education and are determined by the condition of the school building. Among other factors, being prepared to sustain high quality building conditions means considering prior

situations and the politics involved in the administrative decisions concerning the maintenance of the building that, in turn, affect its occupants.

There are other possible factors that influence student achievement and behavior. The building condition might influence the attitudes of parents and faculty and, in turn, might influence the student attitudes. The influence of building condition on students' attitudes might have an impact subsequently on student achievement and behavior. The focus of this study, however, will be limited to an examination of the influence of the condition of the school building upon the academic achievement of students.

Kuwait: Background

The State of Kuwait is a constitutional monarchy in southwestern Asia, bordered on the north and west by Iraq, on the south and west by Saudi Arabia, and on the east by the Persian Gulf (Brown, 2000). The capital is Kuwait City. The state has almost 178 kilometers (120 miles) of coastline on the Arabian Gulf. Kuwait is also one of the world's smallest countries, occupying only 17,818 sq km (6,880 sq mi). In 2000, Kuwait had an estimated population of 2,067,728 (Brown, 2000), although an estimated 50-55% of the residents are foreign workers.

The State of Kuwait is an Islamic country. Kuwaiti society believes in Islam as their religion, philosophy, and lifestyle (Al-Ahmad, Taha, Isa, & Al-Fara, 1987). This means that the *Shari'ah*, which includes the *Holy Qur'an* and the teachings of the Prophet Muhammad, is the foundation for Kuwaiti society and government (Al-Hijji, 1997). Until the end of World War II, Kuwait was a small, poor, traditional emirate whose economy centered on sea trade and pearl exports. The nation was chronically short of water and economically dependent on small-scale fishing, pearling, boating, and trade with countries along the Arabian Gulf. The discovery of oil

in the 20th century transformed all aspects of Kuwaiti society; today the country has one of the highest per capita incomes in the world.

Development and growth in Kuwait, particularly in the Ministry of Education, have also been noticeably affected by various political conditions and events since 1990. The August 1990 invasion and the subsequent occupation by Iraqi military forces caused the collapse of the educational system in place at that time. The Ministry of Education was forced to close many of the public schools. School buildings were prime targets for vandals, and many were also damaged or destroyed by fire and explosions.

Over the last decade, the country has devoted a substantial effort to restoring a successful educational system. In the school year immediately following the invasion, the country was so committed to getting the educational system back on track after missing an entire school year that all students took accelerated classes so that they were returned to their original level by the end of the year. Needless to say, it was a very difficult year, and the price paid was that some of the curricular subject matter had to be left out and students were under a great deal of pressure.

As a consequence, the Ministry of Education has demonstrated that factors perceived to be negatively affecting the outcome of the students merit investigation. Since the condition of the buildings operated by the Kuwaiti Ministry of Education is an ongoing concern and may be contributing to the decline in student test scores, any opportunity to optimize the physical educational environment is welcome.

Kuwaiti Educational System

The magnitude of formal education in Kuwait shifted dramatically in the early 20th century and has since evolved to incorporate many modern technological advances. All public education is centralized and operated by the Kuwaiti Ministry of Education, which also oversees

the operation of private schools to ensure that a quality education is available in all schools. Curricula and policies are standardized throughout the country, and the Ministry continuously monitors and examines academics and achievement in other countries, including their experiences and modern educational theories, and upgrades and improves education nationally. It has established a practice of adopting what is appropriate to the Kuwaiti environment in terms of what is suitable in Kuwait today and in the field of education. Kuwait's current educational system did not run this smoothly from its inception, however, and it has faced many challenges, particularly over the last 12 years.

Education in Kuwait has changed over time to reflect the influences of changes in the Kuwaiti people's socioeconomic and political status and the cultural influences that have affected education. The discovery of petroleum and revenues from crude oil drilling and processing have dramatically strengthened Kuwait's economy, and as a result, a free public education through the college level is available to all citizens. The Kuwaiti government has been able to open and furnish many schools and to educate the many educational professionals needed to support this educational effort. Shafshaq (1973) noted that Kuwait has much faith in education, and the state government has committed itself insuring that a sound educational program functions in Kuwait. Thus, equal access to education is now guaranteed by the Kuwaiti constitution to all citizens, regardless of gender or socioeconomic status. In the not-too-distant past, education was optional and only available to those who could afford the tuition.

Two main governmental bodies oversee education in Kuwait. The Ministry of Education (see Figure 5) is responsible for the supervision of private and public sectors of education through secondary (high) school. The Ministry of Higher Education supervises Kuwait University and the Public Authority for Applied Education and Training (PAAET), which is

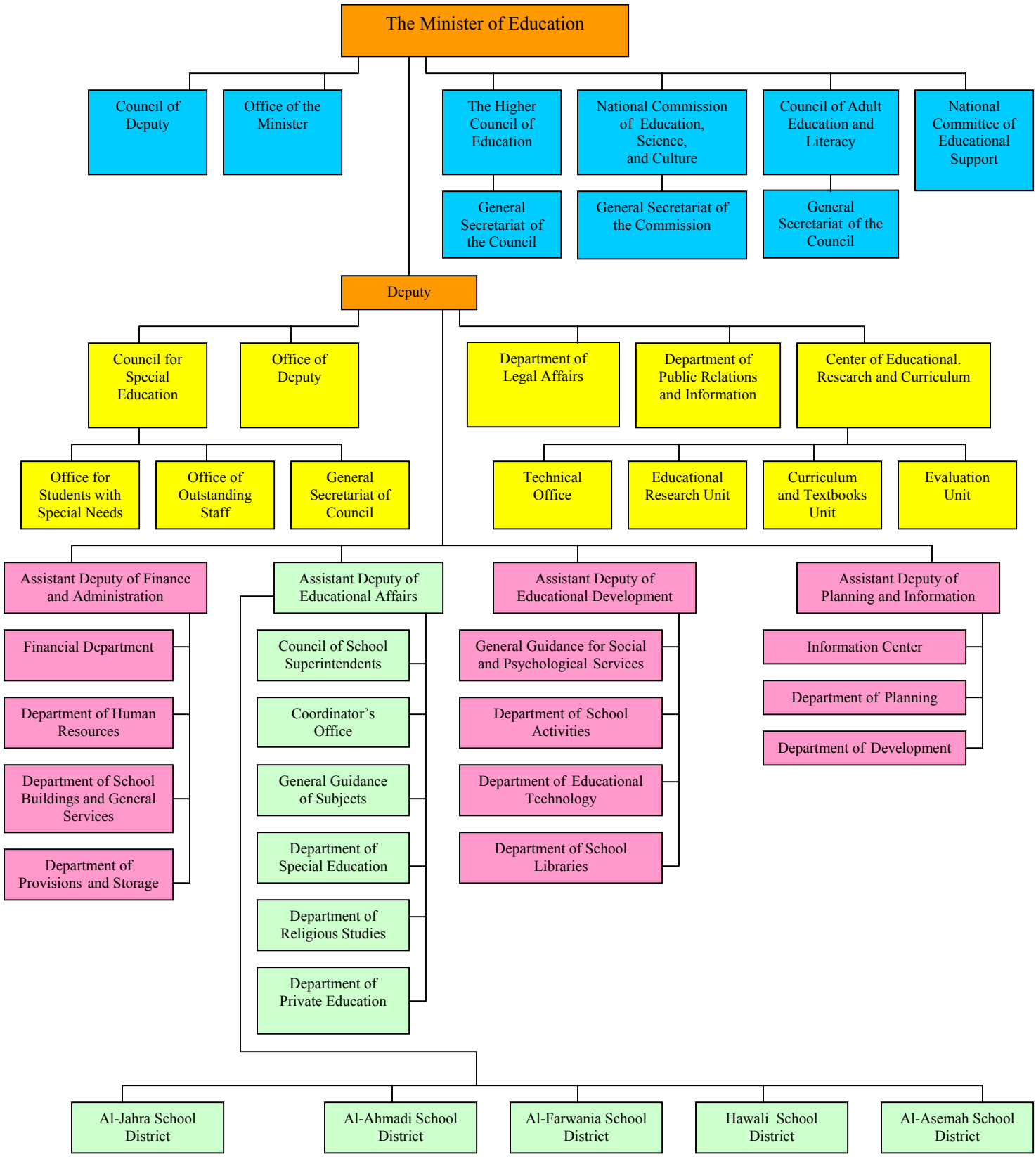

Figure 5. The Organizational Structure of the Kuwaiti Ministry of Education

responsible for vocational education in the applied education institutes and training center. Any student who has graduated from a secondary school can apply to one of the colleges of Kuwait University or one of the Institutes of PAAET. One recent improvement is that current openings at the university are determined in accordance with the country's projected economic needs. The explosion of professional and business opportunities has created many jobs in Kuwait – far more than the country is currently able to train citizens to fill. This means that the country must also employ a substantial number of foreign workers. In order to reduce dependence on non-Kuwaiti employees, Kuwait is also educating a number of students abroad in order to educate the population quickly.

Because Kuwait is an Islamic country, males and females are also educated separately. All children may attend coeducational kindergartens, which are not compulsory. But once a child enters first grade, which is the first year of compulsory education, the boys and girls attend separate schools, and the faculty and staff of the school are of the same gender as the students.[1] (see Figure 6)

Financing Education in Kuwait

The Ministry of Education is responsible for financing and supporting the public schools (Kuwaiti Ministry of Education, 1996). Shafshaq (1973) noted that national support and administration of public education are common in most countries based on the concept of democracy that ensures equal educational opportunities and social equity. He has also

[1] There are a few male elementary schools that have female faculty and staff. This is because there is an abundance of female educators in Kuwait. But all middle and secondary schools for boys have male teachers and staff, and all females are taught by women. Other than these differences, the curriculum, facilities, and equipment are essentially equivalent.

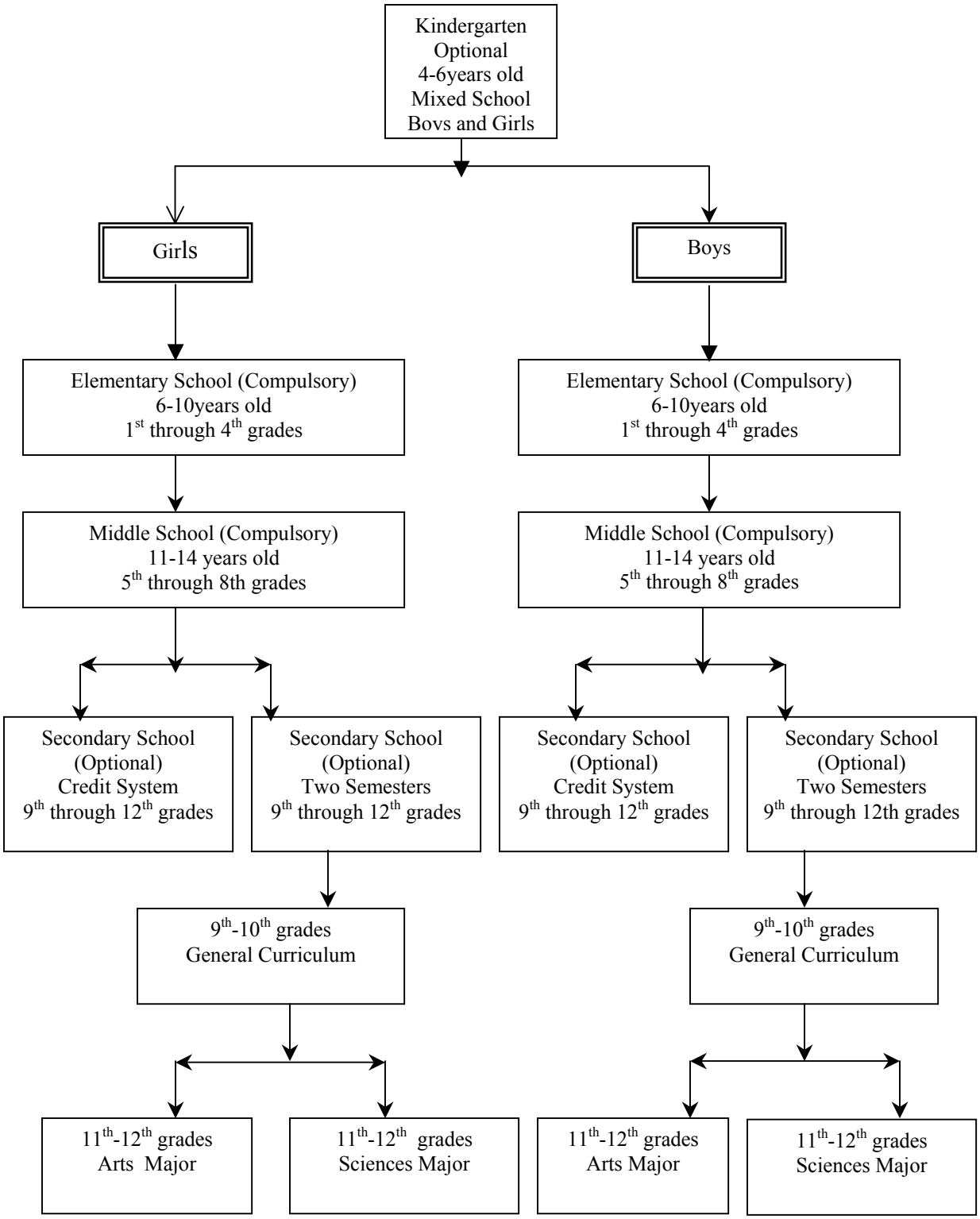

Figure 6. Kuwaiti Public School System: Grade K-12

asserted that centralized distribution of resources helps the individual districts respond equitably to the needs of the increasing number of learners and that maintaining and improving the quality of education includes teachers' and administrators' salaries, educational equipment, and facility management. He has acknowledged that it is difficult to distribute services and resources fairly.

What differs about the Kuwaiti system is that its citizens do not pay taxes not even to fund public education, because the government fully subsidizes the budget for Kuwait's education via the centralized Ministry of Education. One advantage of this standardized approach is that school equipment, teaching materials and resources, and salaries are relatively uniform from school to school. The individual districts are not dependent on revenues generated in their areas, which might fluctuate depending on population density, school size, or population socioeconomic factors. One challenge, however, is that the parties responsible for making major decisions affecting budgetary support for facilities are not necessarily familiar with the individual conditions and needs of a particular school, which means that clear communication between the school and the Ministry is essential for making clear and informed decisions.

Unlike many other countries, where taxpayers contribute the majority of the funding for public education in their region, Kuwait allocates all resources, including support for public education. Other than day-to-day management of the school itself, very little administration is done at the local level. The Ministry of Education provides the schools with their annual budgets. The municipality is responsible for allocation of land for school buildings. The Ministry of Public Works cooperates with the Housing Institution to build and maintain the interiors and exteriors of school facilities and gardens. The Ministry of Water and Power is responsible for providing and maintaining connections and services for these utilities. The Ministry of Health furnishes health care for students. In addition to the support offered at the State level, there are

several committees and foundations at the provincial and local level to support various educational services and features.

The National Committee in Support of Education is a permanent committee established by ministerial decree in 1995 to improve quality and delivery of education in Kuwait. It is supported by public and private contributions. The committee members, veteran Kuwaiti educators and politicians, are governed by an 8-member administrative board. None of the committee members is employed by the Ministry of Education. Since its inception, the committee has facilitated technology education by equipping computer labs in secondary schools, providing the curriculum for computer studies, and introducing computer projects in guidance and extension service offices at syllabus schools. The committee has set-up and maintained school science laboratories and established reference centers in a number of middle and high schools.

The Kuwait Foundation for the Advancement of Science also supports the Ministry of Education. The foundation financed a cooperative project by the Ministry of Education and a local company to expand computer networking and equipment in the schools. The foundation has also furnished and equipped some public libraries and founded a modern, state-of-the-art children's library.

There are also charitable organizations, such as Funds for Scientific Development and Cultural and Intellectual Development, which the General Secretariat of these organizations and the Islamic Affairs Ministry manage. These organizations hold capital in trust, the income of which is used to support and develop educational services and to promote intellectual and cultural activities in Kuwait.

Each school also has a small account that the school administration manages to finance general needs. It is funded by contributions from parents, cooperatives, individuals, profits from the school cafeteria, fundraising efforts, and the Ministry.

The Ministry of Education estimates its fiscal needs based upon the anticipated costs of salaries, maintenance, and materials for the next year's budget. The Ministry of Education also estimates the projected fluctuations in population and considers the factors involved in staying abreast of current trends in international education as well. Some of the financial needs are estimated based on an analysis of the characteristics of school stages and their development and trends, the relationship of each stage to the other stages, and the country's educational goals.

The financial resources are divided into two main categories: capital funds and operational funds. The Ministry of Education uses capital funds to cover educational expenditures that benefit the schools for more than one year. Some of these include school vehicles for student transportation, furniture and equipment, such as audiovisual equipment, overhead projectors, physical education equipment, and library books and materials. The Ministry of Education is also responsible for renovation, remodeling, and major maintenance projects to ensure quality building conditions and provide an environment conducive to learning. The Ministry of Education also allocates the operational funds, which are used to purchase materials that benefit the school for only one year, such as textbooks, workbooks, and other student materials as well as faculty salaries and food for kindergarten students.

Although studies regarding the relationship between the condition of a school building and student achievement have been conducted in both urban and rural areas of the United States, there is a tremendous opportunity to continue this investigation in other school systems, cultures, and nations to validate the findings thus far concerning the impact of school building conditions

on student achievement. Specifically, this type of research will be valuable to the State of Kuwait, where there have been no studies of this nature. This is significant topic because the Kuwaiti Ministry of Education and various professional and community educational forums have addressed twelfth grade student achievement every year since 1995. The purpose of these government discussions has been to determine the causes for the dramatic decrease in the percentage of students passing the twelfth grade final examinations and to identify ways to remedy this situation.

Statement of Problem

Kuwait has launched a national effort to identify the factors that affect the academic achievement of 12th grade public high school students. Because students spend most of their day and year in schools, the school, as the physical environment in which learning occurs, might be one of the components that affect student performance. Therefore, this study has examined whether or not the academic achievement of twelfth grade public high school students in Kuwait is related to the condition of the school facilities.

Purpose of the Study

Mwamwenda and Mwamwenda (1987) stated that when Heyenman and Jamison (1980) examined the relationship between the condition of school buildings and student achievement in developed and developing countries, they came to the conclusion that students in these developing countries perform much below those in developed countries because of the inadequate and poor school facilities. Because Kuwait can be identified as a developing country, it is relevant and vital to examine this relationship to find out if the conclusion of Heyenman and Jamison is valid for Kuwait and thereby provides one explanation for the decrease in the number of students who pass the twelfth grade final examinations.

Research Questions

The study examined whether or not the school building condition was related to student achievement of the 12th grade students in Kuwaiti public schools. The study was based on the following questions:

1. What is the relationship between the condition of school facilities and student achievement in public high schools in the State of Kuwait?
    a. What is the relationship between the overall condition of the facilities and student achievement?
    b. What is the relationship between the cosmetic condition of the facilities and student achievement?
    c. What is the relationship between the structural condition of the facilities and student achievement?
2. Does the relationship between building condition and student achievement differ between boys' and girls' schools?
3. What aspects of physical building conditions are related to student achievement?

Significance of the Study

More research studies on the relationship between the building condition and student achievement in different places of the world are needed, because they can provide useful information about the influence of the various environments on different students (Earthman, 1985). This study conducted in Kuwait plays a key role in generalizing the other studies (Cash, 1993; Earthman et al., 1996; Hines, 1996; Lanham, 1999) for use in other developing nations. The findings of this study have provided more data for the top administration at the Ministry of

Education in Kuwait to support more attention to the quality of a school building condition as a factor that might influence student achievement. The Ministry of Education could use the results of this study to justify upgrading existing schools that are below standard and institute a program of improved school facilities for all new schools.

Operational Definitions

The following definitions are provided for terms used in the study.

School Building Condition

School building condition refers to the rating of the physical condition of a building. This rating was obtained from the revised Commonwealth Assessment of Physical Environment (CAPE). For analysis purposes, the schools that were evaluated are divided into three groups- top quartile, middle two quartiles, and bottom quartile.

There were three building condition ratings-overall building condition, structural building condition, and cosmetic building condition. To measure the effect of building conditions on student academic achievement, the schools that were evaluated are divided into- top quartile, middle two quartiles, and bottom quartile. The overall building condition referred to the rating of all physical building conditions on the revised CAPE. Structural building condition referred to the rating of the physical structure of building, based on 13 items, on the revised CAPE. The structural items were building age, windows, flooring, heating, air-conditioning, roof leaks, adjacent facilities, ceiling covering, science lab equipment, science lab age, lighting, wall color, and exterior noise. Cosmetic building conditions referred to the rating of aesthetic building condition based on eight items on the revised CAPE. The cosmetic items were interior wall paint, exterior wall paint, floors swept, floors mopped, graffiti, graffiti removal, classroom furniture, and grounds.

Student Academic Achievement

Student achievement refers to the mean scores derived from the total scores of twelfth grade students in each school. There were seven sub-test scores used to determine the academic achievement of students in the Sciences major: Islamic education, Arabic language, English language, mathematics, physics, chemistry, and biology. Achievement of students in the Arts major was measured by eight sub-test scores: Islamic education, Arabic language, English language, French language, history, geography, philosophy, and psychology.

A mean score for the sciences major was derived from the test scores of the seven subjects and used to obtain the composite score for each student in each school. The mean for each student was used to develop the mean score for the school. The same process was followed for the Arts major with the mean derived from the test scores of the eight subjects and used to obtain the composite score. The maximum raw score for the year is 100 points. The students can earn up to 75 points on the final examinations in June that are standardized tests prepared by experts in each academic area. The students' total annual scores also include 10 points for the first-session examinations held in January, and up to 15 points based on midterm examinations and student attendance.

Organization of the Study

Chapter 1 has provided the context of the study, theoretical model, statement of the problem, and research questions and sub-questions. It has also included the purpose, the significance, the definitions, and the organization of the study. Chapter 2 includes a review of the related literature regarding the relationship between a school building and student achievement. In addition, it contains studies that have examined the relationship between the overall school

building condition and the academic achievement and behavior of students. Chapter 3 contains the study methodology, which describes the research design, setting, population, and sample of the study. This chapter also describes the data needs, data gathering, and data analysis for this study.

CHAPTER 2: REVIEW OF RELATED LITERATURE

This chapter reviews the body of literature examining the influence of the physical school environment on student achievement. The review focuses on those studies investigating the relationship between overall building condition and student achievement. In cases where overall condition could not be determined, the variable of building age is used as a proxy for the building condition.

School Building Design

The building design concepts of the schools of today did not begin to evolve until the middle of the twentieth century when architects began to experiment with such design concepts as the round and compact schools and such educational concepts as the open-space plan and team teaching. Schools were not perceived as facilities revolving around sound educational programs until as late as the 1970s (Castaldi, 1987). Prior to this, the assumption of those who design schools had been that as long as certain minimum standards for size, acoustics, lighting, and heating were met, a productive environment existed when the teaching-learning process would proceed normally (Conners, 1982). This is because the physical environment and the learning cannot be separated and are considered to be an integral part of each other (Taylor & Gousie, 1988). Christopher (1988) asserted that the purpose of the designed environment is to provide a climate conducive to both teaching and learning.

Although it is common knowledge that the fields of both architecture and education understand that there is a connection between school building conditions and student achievement, there has been little specific research to report exactly how and to what extent building influences student achievement.

Several studies (Christopher, 1988; Hawkins & Overbaught, 1988; Taylor & Gousie, 1988) have tried to establish a connection between building condition and student attitude, but they have provided little solid evidence. Since the late 1970s, however, researchers have identified a more sophisticated research methodology to examine and explain the possible relationship between building condition and student achievement and behavior. Growing numbers of educators and facility planners are considering the influence of such physical factors as school age, color, lighting, seating position, classroom design, density, privacy, noise, and presence or lack of windows on student attitudes and achievement. These studies have been well documented in reviews by Weinstein (1979), McGuffey (1982), and Lemasters (1997).

One line of research examining the relationship between school building age and student achievement that emerged in 1978 uses the age of the school building as a proxy for the quality of the physical environment. However, the assumption that a newer building might have more modern technology and efficient conditions is not necessarily valid. Consequently, older schools are not automatically in worse condition than newer schools.

In most previous studies, school building age has been treated as an independent variable that indirectly influences student achievement with above standard building conditions being associated with higher student achievement. The age of a school building may reflect a combination of some conditions, such as the overall condition of the building, thermal control, acoustics, lighting, and other aesthetic considerations in the environment (McGuffey & Brown, 1978; Chan, 1979). But it is not relevant to consider school building age without considering the other physical characteristics of a school that reflect the quality of the school environment. It is also likely that many older buildings have been upgraded or enhanced, perhaps even more recently than newer buildings.

The initial research into the relationship between academic achievement and building condition focused on the impact of one physical condition variable, such as age, color, lighting on student achievement, but this approach is less favored today than are other research approaches emphasizing the relationship between the "total" overall building condition and student achievement. In fact, the school age variable can be considered as a surrogate for the condition of the building (Earthman & Lemasters, 1996). Research findings concerning building age and building condition as they relate to student performance are reviewed below.

Research on School Building Age

McGuffey and Brown (1978) investigated the influence of school building age on student achievement in the fourth, eighth, and eleventh grades in Georgia. They found that the school facility age does affect what students learn, and that this relationship was not related to student socioeconomic status. They used the scores on the Iowa Test of Basic Skills for the fourth and eighth grade students and the Test of Academic Progress for the eleventh grade students. In comparing the achievement scores with the age of the building, the statistical analyses indicated the building age could account for .5% to 2.6 % of the variance in the fourth grade. In the eighth grade, it explained from 0 percent to 2.6 % of the variance and from 1.4 % to 3.3 % in the eleventh grade.

Other studies (Chan, 1979; Garrett, 1980; Plumley, 1978) have examined the relationship of school building age and student academic achievement in three types of school buildings using different schools and building populations. In these studies, schools were categorized as old non-modernized school buildings, partially-modernized school buildings, or modern school buildings. These studies were designed *ex post facto,* meaning that the non-experimental research took place after the conditions to be studied occurred. Here, there is a post-test, but no pre-test.

These researchers tried to match subjects or otherwise control for variables that might influence the outcomes. These studies used different statistical analyses – multiple regression, step-wise regression, t-test, f-test, and the analysis of covariance (ANCOVA) – to determine whether school building age has a significant impact on student achievement before and after controlling for student socioeconomic status (SES). After statistically controlling for SES, they found little significance in the relationship between school facility age and student achievement.

Phillips' (1997) more recent study investigated the relationship of the age of the school building facilities to the academic achievement of students taught in both old and new facilities. He attempted to identify whether a significant relationship exists between academic achievement of upper elementary school students in three qualifying elementary schools in rural Georgia and the age of the facilities in which their learning occurred. Phillips evaluated the academic achievement of 150 third, fourth, and fifth grade students in selected elementary schools on the Iowa Tests of Basic Skills (ITBS) in the areas of reading and mathematics during the school years of 1993-94 through 1995-96.

Phillips' research design uses a pretest-post-test control group (see Table 1). He explained that "Three cohort groups were developed with the first cohort having no years of the treatment and serving as control group, the second and the third cohort groups having one year of treatment" (Phillips, 1997, p. 42). The older facility housed Cohort One, the control group, throughout third, fourth, and fifth grades. Cohorts Two and Three were moved to newer school buildings, but Cohort Two attended the older school during third and fourth grades and then were moved to the newer school building at the beginning of fifth grade. The third and fourth grade scores of Cohort Two were used as the second control group to compare with Cohort Three. The students in Cohort Three attended the older school building during third grade, and then were

transferred to the newer facility where they completed their fourth grade. Table 1 describes the pretest-post-test control group research design.

Phillips made two comparisons. First, he compared the scores of fourth grade students on each variable from Cohorts One and Two. This was compared to the fifth grade students on each variable from the same cohorts and used them as pre-test and post-test scores. He also compared the scores of third grade students on each variable from Cohorts Two and Three to fourth grade students on each variable from the same cohorts and used the third grade students' scores as pre-test scores and fourth grade students' scores as post-test scores.

Phillips stated five hypotheses, three of which are about the upper elementary school students. These three hypotheses tested the significant relationship between student attendance, and achievement, as represented by students' ITBS scores in reading and mathematics. Phillips wanted to determine whether school facility age influenced student achievement and daily attendance. The other two hypotheses tested whether the students' ITBS scores in reading and mathematics were higher in the newer school facility than in the older school facility.

Phillips used three, not two different statistical analyses, as he has stated. First, he used ANCOVA as a way to control the differences on the pre-test, as well as to adjust post-test scores for initial differences on some variables and to compare adjusted scores. Secondly, he used the product-moment correlation coefficient "Pearson r" to find out any possible significant relationship between students' reading and mathematics scores on the ITBS and the number of student absences after the students in the treatment group were moved to the new school facility. Thirdly, he used one-way ANOVA in order to determine if there were significant differences in student scores in reading and mathematics between groups and within groups. Table 2 indicates the mean reading and mathematics scores of students in the three groups' findings.

Table 1

Research Design

Groups	1993-94	1994-95	Students moved to new facility	1995-96
Cohort One (Control)	O_{4a}	O_{5b}		--
Cohort Two (Control/Treatment)	O_{3a}	O_{4b}	X	O_{5c}
Cohort Three(Treatment Only)	--	O_{3a}	X	O_{4b}

Note. From "Educational facility age and the academic achievement and attendance of upper elementary school students," by R. Phillips (1997). Unpublished doctoral dissertation, University of Georgia, p. 43. Adapted with permission of the author.

"O" represents Observation (data collection)

"X" represents Treatment (taught in new facility)

1995-1996 was the first year in the new school facilities.

"3" Indicates study subjects currently in third grade

"4" Indicates study subjects currently in fourth grade

"5" Indicates study subjects currently in fifth grade

"a" Indicates initial observation

"b" Indicates second observation

"c" Indicates third observation

Table 2

A Comparison of Mean Scores on Reading in the Three Cohort Groups

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

Note. Adapted from "Educational facility age and the academic achievement and attendance of upper elementary school students," by R. Phillips (1997). Unpublished doctoral dissertation, University of Georgia, p. 51-53. Adapted with permission of the author.

The mean of reading and mathematics scores of the fifth grade students of Cohort Two attending the newer facilities were higher than those of Cohort One attending older facilities. Moreover, the reading and mathematics mean scores of the fourth grade students from Cohort Three attending newer facilities were higher than those of Cohort Two attending older facilities.

The null hypotheses stated that academic achievement of upper elementary students housed in a new facility would not be higher at a significant level ($p \leq .05$) than the achievement of upper elementary students taught in older school facilities, as measured by their performance on the reading and mathematics sections of the ITBS. Table 3 indicates that these null hypotheses were rejected for comparison in reading and mathematics for Group One and in mathematics only for Group Two, but was retained for comparison in reading for Group Two.

Phillips concluded that movement to newer school buildings had a positive influence on student achievement and attendance. The age of the building appeared to be able to enhance or inhibit what is taught and how it is taught. In other words, the school building can be an inspiration to a student or it can be the opposite.

Research on Overall Building Condition and Student Achievement

The impact of the physical environment on humans, specifically student achievement, is frequently subtle and difficult to measure accurately. Identifying particular physical building factors or conditions, such as lighting, color, classroom size, air conditioning and determining how they affect student academic achievement can be very complex. Duke (1998) did not deny that students are capable of learning in spite of any obstacles imposed by the setting, although it is reasonable to want to know what settings or conditions maximize student performance.

Table 3

Analysis of ANCOVA for Cohort Differences in Reading and Mathematics Achievement on the ITBS for Comparison of Groups 1 and 2

		Subject	*F*	*p*
Comparison Group 1	Cohort (Treatment)	Reading	5.18	.024*
		Math	15.52	.000*
	Pretest (Covariate)	Reading	731.94	.000
		Math	731.94	.000
Comparison Group 2	Cohort (Treatment)	Reading	0.63	.427
		Math	6.47	.011*
	Pretest (Covariate)	Reading	815.02	.000
		Math	388.02	.000

Note. From "Educational facility age and the academic achievement and attendance of upper elementary school students," by R. Phillips (1997). Unpublished doctoral dissertation, University of Georgia, p. 63-68. Adapted with permission of the author.

*p≤ .05

Bowers and Burkett (1987) examined the relationship between the school physical environmental conditions and student achievement to determine if student learning, performance, and achievement might be directly affected by the conditions of the school building. From rural Tennessee county school systems, they selected two elementary schools, one new and the other old for the study. These two elementary schools served grades kindergarten through eight. The modern school which had 758 students during the 1983-84 school year, contained fluorescent lighting, electric heat, and air conditioning. In addition, the acoustics, color schemes, and furniture in this school blended into the physical environment. The older school, built in 1939, with an addition added in 1950 housed 584 students. The older school building had fluorescent lighting, a coal-fired furnace, and several air conditioning units. There were no efforts made to control the acoustics, coordinate colors, and replace outdated furniture. Two hundred eighty students from fourth and sixth grades in the two schools were tested during the 1986-87 school year. The scores from these tests were used to determine the degrees of difference between student achievement in these settings. In order to find out if there were differences between achievement test scores for the two groups, Bowers and Burkett used ANOVA and the t-test.

After controlling the socioeconomic status of students in both settings, it was found that students in the modern school building scored significantly higher in reading, listening, language, and arithmetic than did students in the older school building. Table 4 displays the differences in the student mean scores in the modern and the older school building. This study indicated the positive and negative impact of the age of the school building on student achievement. Because old school buildings lack some quality conditions that are present in new

Table 4

Comparison of Grades 4th and 6th student achievement between students in a modern, attractive physical environment (1) and students in older less attractive building (2)

Subject	School	*N*	*M*	*SD*	*F*	*p*
Reading	1	132	88.54	15.43	13.19	.000
	2	127	80.94	18.40		
Listening	1	132	61.70	8.06	49.93	.000
	2	127	53.59	10.66		
Language	1	132	77.89	13.49	12.53	.000
	2	126	71.63	15.21		
Math	1	132	91.32	18.26	35.76	.000
	2	127	96.46	21.81		

Note. 1= modern school; 2=older school. From "Relationship of student achievement and characteristics in two selected school facility environmental settings" (p.8) by J. H. Bowers and C. W. Burkett (1987, October). Paper presented at the 46th Council of Facility Planners, International Conference in Edmonton, Alberta, Canada.

school buildings, such as proper lighting, the students in the old schools did not perform better than students in new schools.

A new research approach focusing on the relationship between the building condition and student achievement has emerged after the study Edwards conducted in 1991. Edwards sought a relationship between the condition of the school building and student achievement. Her study of schools in the District of Columbia found that after controlling for students' socioeconomic status, students' standardized achievement scores were lower in schools in poor condition than those of students attending schools in excellent condition. Academic achievement of students in poor school buildings was 5.45% points below that of students in schools in fair condition and 10.9% points below that of students in schools in excellent condition. She concluded that educational building conditions were hampering student achievement and estimated that improved facilities could lead to a 5.5% to 11% improvement on standardized tests. These findings indicate that the proper learning environment would have the features of a new building that are associated with higher student achievement. In contrast, because proper conditions are not available in old school buildings, the function of the schools as environments for learning seems to be compromised.

The relationship between building condition and student achievement was not given attention in the past, but this has been changing. More and intensive efforts have been made to study this relationship. Most of the methodology design of the above mentioned research studies correlates with nature. It has been designed to determine the type and degree of relationships that exist between each of the independent variables, the school building conditions, and the dependent variables, student academic achievement and student behavior. In these research studies of the relationship between building condition and student achievement, two sets of data

need to be counted. First, the researchers use an assessment survey of the conditions of the school building. School facilities exist to serve an educational function. The common intervening consideration in the evaluation of the educational facilities is how effectively they meet the needs of the students they serve (Hill, 1984).

Secondly, the researchers have relied heavily upon standardized tests of basic skills in order to measure student achievement. They gathered the standardized tests scores of students who occupy the targeted school. In most of these kinds of research studies, the socioeconomic backgrounds of students were statically controlled. Coleman et al. (1966) stated that schools do not make a difference in student achievement. In their report, they indicated that the differences in the student achievement are cause by the differences in the student economic and social backgrounds (Lezotte & Passalacqua, 1978). When the socioeconomic status has been controlled (e.g., Cash, 1993; Earthman, et al., 1996; Hines, 1996; Lanham, 1999), it has been found that schools make a difference, although a small one, not only on student achievement but also on student behavior. This finding indicates the importance of the quality of the conditions of school buildings on student achievement. Good school conditions appear to be an important precondition for student achievement, providing that other conditions are present that support a strong academic program in the school.

Cash's study (1993) was the first study that dealt merely with the overall building conditions. Cash examined the relationship between the condition of school facilities and student achievement and behavior. Her study used the entire population of small, rural high schools in Virginia. More specifically, the sample was 47 schools in 36 school divisions in Virginia, which had a population of fewer than 100 seniors in the 1991-92 school year and were located outside urban areas. Building condition was determined by the Commonwealth Assessment of Physical

Environment (CAPE), which was completed by personnel in the divisions of these 47 schools. Student achievement was determined by the scale scores of the Test of Academic Proficiency (TAP) for grade eleven during the 1991-1992 school year. Student behavior was determined by the ratio of the number of expulsions, suspensions, and violence/substance abuse incidents to the number of students in each school. All achievement scores were adjusted for socioeconomic status by using the percentage of students in the free and reduced lunch program. These variables were investigated using analysis of covariance, correlations, and regression analysis.

Cash divided school building conditions into two categories: structural conditions and cosmetic conditions. Structural conditions related to physical features of the school buildings, such as air conditioning, presence of windows, lighting, and conditions of lockers, while the cosmetic conditions related to aesthetic aspects, such as recent painting, presence of graffiti, and cleanliness.

Three comparisons were made with student achievement scores. First, student achievement scores were compared to all items on the CAPE to generate an overall building condition category. Schools were rated as being in substandard condition, standard condition, and above standard condition. Students' mean scores were compared across these three conditions. Table 5 shows the findings of this comparison. It was found that students' scores in writing were lower for sub-standard building conditions than above-standard building conditions. In science, the average scores of students taught in above standard building conditions were in the 55%, while the average scores of students taught in sub-standard building conditions were in the 50%.

Table 5

A Comparison of Percentage Ranks on the Subtests of the Test Academic Proficiency (TAP) for Grade 11 During School Year 1991-92 and Overall Building Condition, Cosmetic Building Condition, and Structural Building Condition

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

Note. From Building Condition and Student Achievement and Behavior, (p.46-51) by C. Cash (1993, April).

- Achievement Percentage Ranks Derived from Complete Composite Scale Score Means that have been adjusted for Social Economic Status. * Percentage Ranks of Substandard Building Condition is higher than Above Standard Building Condition. ** No Differences on Percentage Ranks between Substandard and Above Standard Building Condition. Adapted with permission of the author.

Secondly, the two major categories, structural and cosmetic building conditions were used to examine the relationship between different sections of the CAPE with student achievement scores in 21 schools rated as above standard and the condition of 20 school buildings rated as sub-standard (see Table 5).

For the cosmetic building condition, the results indicated that all the scores of students in building with above standard cosmetic conditions ranged from one to four points higher than those of students taught in building with sub-standard cosmetic conditions. The exception was the scores in Social Sciences.

Interestingly enough, the findings indicated that students in the with buildings with above average structural conditions scored lower than those students in sub-standard school buildings in five cases: Reading, Basic Composite, Social Studies, Science, and Complete Composite (see Table 5). However, students who attended schools rated as above standard structural building condition scored higher in all sub-tests than students attending schools rated as sub-standard building condition with only one exception, which was Written Expression.

Cash found that the student achievement scores were higher in schools with better building conditions. The number of student discipline incidents were also higher in schools with better building conditions. Science achievement scores were better in buildings with better science laboratory conditions. She found that student achievement in science was 5% higher in the buildings rated as being in above-standard condition than in buildings rated as being in sub-standard condition. The increase was found in the science subtest and in the complete composite score.

Cosmetic building conditions appear to affect student achievement and student behavior more than structural building conditions. Finally, varying climate control, locker condition, and graffiti conditions are factors that influence student achievement scale scores.

It can be seen that in Cash's study, the results were not clear, and there were no conclusive explanations for the findings stated in this study. This was perhaps because there were other confounding factors that played a significant role for students in above standard structural and cosmetic building conditions who scored lower than those in sub-standard structural building conditions. Such factors might include the sample size, parental involvement, teachers' experiences, teachers' attitudes toward the school building, and students' attitudes toward the professionalism of their teachers. Having more samples in this study might have changed the results to what was expected and predicted to affect student achievement.

There have been a number of studies conducted that replicated Cash's study. These studies are much the same as studies of the relationship between the school building age and student achievement. However, the studies that deal with overall building conditions rely heavily on a more comprehensive assessment of the school building conditions in order to better determine if the student achievement varies in different building conditions.

Earthman, Cash, and Van Berkum (1996) conducted a statewide study similar to Cash's 1993 study of North Dakota high schools. They selected North Dakota because the population is relatively homogeneous, the students' test scores on the SAT are among the highest in the nation, and the math scores of North Dakota eighth grade students were the third highest in the international comparisons of eighth grade math scores in 1992. They attempted to examine the relationship between the building condition and student achievement and behavior using a methodology similar to that used in Cash study. They examined 199 high school buildings in

North Dakota. The building conditions were measured by principals' survey responses to the State Assessment of Facilities in Education (SAFE). The measure of student achievement was eleventh grade students' scores on the Comprehensive Test of Basic Skills (CTBS). The instrument had three categorical conditions: overall building condition, structural building condition, and cosmetic building condition.

First, they compared overall building condition to student academic achievement on 13 components, "cases or sub-tests" of the CTBS listed in Table 6. They found that the test scores of students in above-standard building conditions were one to nine percentage points higher than those in sub-standard building conditions on eleven subtests. Test scores of students in sub-standard building conditions were one percentage point higher than those in the above-standard building conditions on the Math Total case (see Table 6). There were no differences in the scores of students in above-standard building conditions and sub-standard building conditions in Social Studies.

Secondly, they compared cosmetic conditions of the building with student achievement. They found that test scores for students in above-standard building conditions were one to eleven percentage points higher than students attending substandard buildings on twelve subtests. The exception was English Mechanics, in which no difference in student achievement was found for above standard building condition and substandard building conditions. Third, they compare the structural building condition with student academic performance. When they ran the comparison, they found interesting and surprising results. The scores of students in above standard building conditions were one to eight percentage points higher than those of students in substandard building conditions on only eight subtests instead of thirteen subtests. The five remaining subtests revealed that the scores of students in substandard building conditions were three to

Table 6

A Comparison of Achievement Percentage Ranks on the Subtest of the Comprehensive Test of Basic Skills (CTBS) for Grade 11 During School Year 1993-94 and Overall Building Condition, Cosmetic Building Condition, and Structural Building Condition

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

Note. From "Student achievement and behavior and school building condition" by G. Earthman, C. Cash, and D. Van Berkum, 1995. The Journal of School Business Management, 8, (3), 30-37. Achievement Percentage Ranks derived from a Total Battery Scale Score Means that have been adjusted for Socioeconomic Status. *Percentage Ranks of Substandard Building Condition are higher than Above Building Condition. ** No Differences on Percentage Ranks between Substandard and Above Standard Building Condition

twelve percentage points higher than those of students in above standard building conditions on four subtests, Math Comp, Math Concept and Application, Math Total, and Social Studies, while there was no difference in the scores of students on Reading Comprehension. Earthman et al. found a positive relationship between school condition and both student achievement and student behavior.

Hines' (1996) study of large urban high schools in Virginia also found a positive relationship between building condition and student achievement. This study, however, should be reviewed with caution due to the problems apparent in the way school buildings were classified as substandard, standard, and above standard as it was done in the Cash's study. This study examined the relationship between the condition of school facilities and student achievement and behavior in selected high schools in urban areas of Virginia. Building condition was determined by the Commonwealth Assessment of Physical Environment, which was completed by personnel in the divisions of the 88 schools in the population. Student achievement was determined by the scale scores of the test of Academic Proficiency for grade eleven during the 1992-1993 school year. Student behavior was determined by the ratio of the number of expulsions, suspensions, and violence or substance abuse incidents to the number of students in each school. All achievement scores were adjusted for socioeconomic status by using the percentage of students in the free and reduced lunch program for each school.

This study, the results of which are shown in Table 7, found that student achievement scores were higher in schools with better building conditions. Indeed, Hines found that student achievement was as much as 14% points lower in buildings with substandard conditions than buildings with above-standard conditions.

Table 7

A Comparison of Percentage Ranks on the Subtests of the Test Academic Proficiency (TAP) for Grade 11 During School Year 1992-93 and Overall Building Condition, Cosmetic Building Condition, and Structural Building Condition

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

Note. From Building Condition and Student Achievement and Behavior, (p.49-59) by E. Hines (1996, July).

Achievement Percentile Ranks Derived from Complete Composite Scale Score Means that have been adjusted for Socioeconomic Status.*Percentile Ranks of Substandard Building Condition is higher than Above Standard Building Condition.** No Differences on Percentile Ranks between Substandard and Above Standard Building Condition.

In above standard building conditions, students achieve as much as 15, 17, 9, 13, 13, 11, and 9 points more than students in substandard building conditions in reading comprehension, mathematics, written expression, sources, basic composite, social science, and science, respectively. Science achievement scores were 1.48 points higher in buildings with better science laboratory conditions. In general, students in the above-standard buildings achieved 9% more than students in substandard buildings. Varying climate control conditions, lockers, and graffiti were factors which influenced student achievement scale scores. These findings, especially the big differences, may have been due to the inconsistent use of the methodology proposed for this study.

From these studies (Cash, 1993; Earthman, Cash, & Van Berkum, 1996; Hines, 1996), it can be seen that it is difficult to determine profound and specific building conditions and relate them to student achievement. Some of these research findings are various, complicated, and inconclusive. More specifically, the results of these studies regarding air conditioning, lighting, and noise or acoustic condition indicated a reverse relationship between the building conditions and student achievement.

Table 8 illustrates that sample size made the differences in the three studies, even though the final judgment accounted for the better building conditions and explained the higher student achievement. Although these three studies indicated a relationship between building condition and student achievement and differences in student achievement based on building conditions, this relationship and the differences were not significant. Using one-way ANOVA might have helped to find out if there is a significant relationship between the condition of a building and student achievement. This statistical analysis also might help to find out if the building condition contributes to the significant differences in student achievement. Moreover, regression

Table 8

The Range, Count, and Percentage of Scores in Each Category: Overall Building Condition, Cosmetic Building Condition, and Structural Building Condition

		Overall Building Condition			Cosmetic Building Condition		Structural Building Condition	
Researcher(s)		Sub Standard	Standard	Above Standard	Lower	Upper	Lower	Upper
Cash (1993)	*Range*	1.9-2.1	2.2-2.4	2.5-2.8	2.0-2.4	2.5-3.0	1.6-2.1	2.2-2.7
	N	10	21	10	20	21	24	17
	%	24.4	51.2	24.4	48.8	51.2	58.5	41.5
Hines (1996)	*Range*	1.91-2.27	2.28-2.65	2.66-2.95	2.17-2.82	2.83-3.0	1.78-2.49	2.50-2.78
	N	8	36	22	20	46	33	33
	%	12.1	54.5	33.4	30.3	69.7	50.0	50.0
Earthman, Cash Van Berkumm 1996	*Range*	1.864-2.2	2.21-2.462	2.463-2.92	1.8-2.4	2.81-3.0	1.5-2.063	2.376-2.938
	N	29	64	27	26	30	25	24
	%	24.0	53.0	23.0	22.0	25.0	21.0	20.0

Note. From C. Cash, (1993), E. Hines (1996), and G. Earthman, C. Cash, and D. Van Berkum (1996).

analysis might have lead to different results. Step-wise multiple regression, for example, helps to find out the predicted variables explained by the student achievement. This might be more helpful than finding the differences in student achievement scores between above standard and substandard building condition to make the final judgment.

Lanham's study replicates Cash's (1993) study. Lanham (1999) has examined the relationship among a number of variables related to the conditions of the school buildings and classrooms in Virginia elementary schools and student achievement. He modified the Cash Model by adding one factor, the deferred maintenance that he predicted would negatively affect the building and classroom conditions. He also added four items about technology that were used for a report analysis. His population for the study was all elementary schools in Virginia containing grades three and five. A systematic random sample of 300 schools was selected from this population. The conditions of buildings and classrooms, as well as demographic information, was assessed using an Assessment of Building and Classroom Conditions in Elementary Schools in Virginia, which was about the same as the instrument used in the studies of Cash (1993), Earthman, et al. (1996), and Hines (1996) in order to determine the condition of the school buildings. One hundred sixty-one school principals completed this survey.

Lanham used the Standards of Learning Assessments (SOLs) of Spring 1998 student achievement. Scaled scores were used for the third grade English assessment, fifth grade English assessment, third grade mathematics assessment, and fifth grade mathematics assessment. The percentage passing score was used for the fifth grade technology assessment, as scaled scores were not available. The demographic information from the study showed that a large portion of Virginia elementary schools was more than thirty years old and had a number of structural and classroom defects. While principals gave high composite ratings to their schools, their responses

to individual questions showed problems with roof leaks and climate control. Information on the percentage of students on free and reduced-price lunches was collected as a control for the socioeconomic status.

Lanham used two statistical analyses, a Pearson's product moment correlation matrix and a step-wise multiple regression analyses. The Pearson r was used to find out the interrelationships among various independent variables that were the items listed in the building assessment instrument, while the statistical analysis, a five-step multiple regression analysis, was used to help him determine the relationship between the identified dependent and two or more independent or predictors variables. The statistical analysis indicated that the percentage of students participating in the free and reduced-price lunch program was the most significant variable in student achievement as measured by the Standards of Learning Assessments.

Table 9 shows the findings after using the step-wise multiple regression as a statistical technique to investigate the independent variables or predictor variables that explained the third grade English and mathematics scores, and fifth grade English, mathematics, and technology scores. In order to do so, Lanham entered all of the independent variables. These were the items of the school building assessment. He listed building age, building purpose, years since last renovation, room structure, roof integrity, years since last interior painting, years since last exterior painting, electrical services, floor type, overall building maintenance, overall structural condition, classrooms in trailers, classrooms without windows, heating quality, air conditioning quality, ceiling type, lighting type, wall color, sweeping frequency, mopping frequency, electrical outlets, local-area network access, Internet access, cable TV access, furniture condition, classroom structural condition, classroom cosmetic condition, overall condition, enrollment, percentage of students in the free or reduced–price lunch program, and total site size.

Table 9

Step-wise Multiple Regression for the Explanation of the Third Grade English and Mathematics Assessment Scores and Fifth Grade English, Mathematics, and Technology Assessment Scores

Grade	Subject	Step	Variable Entered	*R*	R^2	*Increase in* R^2
Third Grade						
	English	1	Free and reduced-price 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-price lunch	509	.259	
		2	Room Structure	545	.297	.038
		3	Mopping frequency	567	.322	.025
Fifth Grade						
	English	1	Free and reduced-price lunch	722	.522	
		2	Wide area network	737	.543	.210
	Math	1	Free and reduced-price lunch	397	.158	
		2	Air conditioning	431	.186	.028
	Technology	1	Free and reduced-price 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. From "Relating Building and Classroom Conditions to Student Achievement in Virginia's Elementary Schools," by J.W. Lanham (1999). Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University. Adapted with permission of the author.

The variable of free and reduced-price lunch programs had greater influence on student scores in English and technology than in mathematics. Poor air conditioning quality was a significant factor in the variance of scores. The variance accounted for 1.6% of the total variance in third grade English, 2.8% for fifth grade mathematics, and 4.8% for fifth grade technology. Other variables found significant in one or more of the analyses were ceiling type, site size, frequency of floor sweeping, frequency of floor mopping, connection to a wide-area network, room structure, overall building maintenance, and flooring type.

One aspect that was not addressed was what might happen to these results if the free or reduced-price lunch program had been controlled. Do the other independent variables help explain the dependent variables? Lanham in his study neither controlled the social economic status represented by the free or reduced-price lunch program nor adjusted the student scores.

Even though his findings indicate the most independent variables explain the students' scores, some of these independent variables in the previous studies of Cash (1993) did not tell whether these independent variables influenced positively or negatively the student achievement. It would be helpful if Lanham had divided schools into three conditions (e.g., above standard building condition, standard building condition, and substandard building condition) as Cash (1993), Earthman, et al. (1996), and Hines (1996) did in their studies. These conditions would have helped Lanham to correlate student achievement with these conditions to see if, for example, a specific condition led to higher student achievement. He also could have used the step-wise multiple regression for each condition to explore condition variables explained on student achievement. Finally, Lanham did not relate and compare the principals' responses to the components of the student achievement. In other words, did students in newer schools achieve

higher scores than those students in older schools? It would be helpful if the rating of each item in the school assessment instrument were related to student achievement.

Gravelle (1998) has investigated the relationship between student academic achievement and the conditions of the school buildings. She also considered the cost per pupil, school district size, and dropout rate to further investigate the strength of the relationship between school building conditions and student achievement. The study population was the sixth, eighth, and eleventh grade classes of 104 public school districts in the 1992-1993 school year in Idaho. Gravelle used the raw scores of two types of tests to determine student academic achievement: raw scores on the Iowa Tests of Basic Skills (ITBS) for the sixth and eighth grades and raw scores on the Tests of Achievement and Proficiency (TAP) for the eleventh grade. The unadjusted scores of the Building Condition and Suitability Evaluation assessed school building conditions.

The results from the sixth grade class show that there was a significant positive relationship between student achievement and expenditure per pupil. This suggests that money invested in education is a wise investment and that funds spent to ensure a quality education are evidently worthwhile, particularly at the elementary level.

From the eleventh grade, there were no relationships between student achievement and school building conditions, cost per pupil, school district size, or dropout rate. Thus, Gravelle's findings regarding the relationship between the building condition and student achievement substantiate those of Cash (1993), who also found that structural building conditions did not influence student achievement.

Because variances and correlations were relatively small, it can be concluded that the findings concerning the relationships between student achievement and school building

conditions, cost per pupil, school district size, and dropout rate from the sixth, eighth, and eleventh grades were inconclusive.

Cervantes (1999) has examined the relationship between the school building condition and academic achievement and behavior of students who are enrolled in fourth, seventh, and eleventh grades in selected Alabama public schools. These school facilities were evaluated by using the Guide for School Facility Appraisal Instrument prepared by Hawkins and Lilley (1992). This instrument contains six major areas: school site, structural and mechanical, plant maintainability, school building safety and security, educational adequacy, environment for education, and overall building condition. In general, this instrument includes some architectural and building features that do not directly relate to student achievement. Cervantes' study sample included 19 schools: eight unit schools (K-12), four elementary schools (K-5), two middle schools (6-8), and five high schools (9-12). He used the Stanford Achievement Test (9th ed.) reading and math scores to measure student academic achievement and the disciplinary suspension rates at these schools to measure student behavior. Cervantes analyzed the achievement scores and suspension rates and established any possible relationship between the total building condition rating and the six major building categories with the Pearson correlation statistical procedure.

The findings in the unit schools indicated that there is a negative relationship between reading achievement and the school building category of environment for education ($\underline{r}$ = - 4.84). Cervantes did not find any significant relationship between reading achievement and the six building categories or the total building condition for the fourth, seventh, and eleventh grades. However, in eleventh grade, across all schools, he noted a relationship between reading achievement and the building category of school site ($\underline{r}$ = .639).

In all eight of the unit schools, findings indicated two significant relationships: a positive relationship between math achievement and the building category school site ($\underline{r}$ = .532) and a negative relationship between math achievement and plant maintainability ($\underline{r}$ = - .530). The findings did not indicate any significant relationship between reading achievement and the six building categories or the total building condition in the fourth, seventh, and eleventh grades. However, in eleventh grades across all schools, he noted a relationship between math achievement and the building category of school site ($\underline{r}$ = .780).

Because he included only 19 school buildings in his population and because of this small number, some of his findings may be skewed. A larger sample of schools might significantly change the findings. Cervantes did not report on his observations regarding the correlation of specific variables (e.g., lighting, thermal condition) with student achievement.

In the case of the Cervantes study, it might be advantageous to categorize schools by three building conditions as determined by the evaluators: Excellent, Satisfactory, and Borderline. It would be helpful to run correlations between the three conditions and student achievement in math and reading to seek the relationship, for example, between reading achievement of students in each school and the percentage of evaluators (0-100%) that determined the final evaluation of that building condition (e.g., excellent condition, poor condition). The next step would be to run a one-way ANOVA to compare the total math achievement and reading achievement of students within one group condition, such as excellent condition and then compare these achievements of students among the three groups of building conditions.

In terms of measuring suspensions, it would be best if Cervantes ran a Chi Square analysis for each building condition in order to see what is expected and what is observed; hence,

it is possible to determine if the condition of the building contributes positively or significantly to the number of the suspensions that affect student achievement.

The findings in these four studies support what has been found in previous studies, particularly that the failure to control ventilation, temperature, and cleanliness sabotages the facility's ability to provide an environment conducive to student learning.

Andersen's study (1999) should also be interpreted with caution due to the methodological problem noticed in his study. He has examined the possible relationship of 38 middle school design elements to student achievement of eighth grade students on the Iowa Test of Basic Skills (ITBS) using a sample of 50 middle schools. Student socio-economic status was statistically controlled using the analysis of covariance to adjust the ITBS scores of each school related to socioeconomic status, race, and teacher experience. The schools composite ITBS scores were placed on a continuum from high to low. The top 11 and bottom 11 schools were selected as the sample. The scores on the Design Appraisal Scale for the Middle (DASM) were used to explore a relationship between the design factors and the ITBS scores. It was found that there was a relationship between the 27 design factors and the ITBS scores.

It is not possible to generalize the findings in Andersen's study, however, due to a methodological problem. Personal judgment was used to appraise the building condition in the site visits that were made to the schools. Because there was no report of measures taken to control for varying personal interpretations, it may be assumed that the data contains a potential source of bias.

Most studies reviewed in this chapter suggest that the building condition can explain and account for the variance in student achievement. The better quality school buildings tend to encourage student achievement. More studies are needed to support the findings of most studies

conducted regarding the relationship between the condition of a school and student achievement. In addition, this relationship should be examined with more caution using useful statistical techniques in order to indicate significant differences in the mean scores of achievement examinations between school building conditions in the lowest category and those in the highest category.

Summary

The purpose of this chapter has been to review studies that have examined the relationship between the school age and student achievement. In addition, the studies regarding the relationship between building conditions and student achievement were reviewed. In these studies, researchers have analyzed the relationships between building conditions and student achievement by evaluating the condition of school buildings. Student achievement was measured by some form of standardized tests. In the studies of the relationship between building age and student achievement, it was found that there is a range of differences in the mean scores of achievement examinations between old and new schools. As for the studies that examined the relationship between the building conditions and student achievement, it also was found that there is a range of differences in the mean scores of achievement examinations between schools categorized as sub-standard and those identified as above standard.

CHAPTER 3: METHODOLOGY

This chapter includes a description of the research design, setting, population, and sample of this study. It also identifies data needed for this study, the method of collecting data, and the statistical methods used to analyze the data.

Research Design

Since this study is non-experimental, a descriptive research "methodology" design was used. Descriptive research is a type of quantitative research used to explore the possible causal relationships between different variables (Borg, Gall, & Gall, 1996). This research design was used to answer the following research questions:

1. What is the relationship between the condition of school facilities and student achievement in public high schools in the State of Kuwait?
    a. What is the relationship between the overall condition of the facilities and student achievement?
    b. What is the relationship between the cosmetic condition of the facilities and student achievement?
    c. What is the relationship between the structural condition of the facilities and student achievement?
2. Does the relationship between building condition and student achievement differ between boys' and girls' schools?
3. What aspects of physical building conditions are related to student achievement?

Setting

Kuwaiti law stipulates that education is compulsory and free to all Kuwaiti children ages 6 to 14 years (elementary and middle school levels). Since kindergarten is optional, formal schooling officially begins in first grade at age six (see Figure 6, p. 16). Although not compulsory, secondary level (high school) attendance is encouraged and available free of charge. While kindergartens in Kuwait are open to both boys and girls and have an all female staff, once they enter first grade, students are segregated by gender, in compliance with Islamic principles. Except for a few elementary schools for boys with female teachers, the students and the teachers are of the same gender. But other than gender segregation, there are few differences in the curriculum, facilities, and standards for the students. This is worth noting, because this study differentiates between facilities available for boys and facilities for girls, but this distinction merely refers to specific school buildings. The standards for furnishing, comfort, equipment, teacher training, and student achievement are the same for both genders.

There are two different programs available at the high school level. Some schools offer a standard two-semester program and assign students to the individual courses. Other schools allow the students to select among a range of courses in a credit program. This study was confined to the schools that assign the students to the classes on a regular two-semester program. In these standard two-semester schools (ninth through twelfth grades), students are taught a standard selection of subjects during the entire school year and tested in all subjects except Music and fine Art at the end of the first session (middle of the school year) and at the end of the second session (end of the school year). Students must pass the examinations in all subjects to be promoted to the next grade or to graduate from high school. To pass any subject, the student must earn 50% of the overall “maximum” score on both the first and second session

examinations in each subject. Students who fail up to three of the examinations are allowed to retake the tests after attending remedial program sessions offered in the summer of the same year. Students who fail more than three tests are obligated to repeat the grade the following school year.

Once a student completes tenth grade, he or she chooses an academic major: Sciences or Arts. The student will then continue in the same major for the rest of high school. There is a uniform schedule of coursework for each of the academic subjects (see Table 10). All twelfth grade students in both majors are required to take the final high school examinations, and the high school diploma is only awarded if the student passes in all the subjects.

In the credit system, the students are also allowed to choose their major and then select their classes according to the requirements of their major. To graduate, students must complete all courses with a cumulative GPA of 2.0 on a 4.0 scale.

Population and Sample

Although there are a total of 138 high schools in Kuwait, the target population for this study was the 56 public high schools, 28 boys' schools and 28 girls' schools that use the two-semester system. This "convenience," purposeful sample was selected because students in these schools are tested using standardized tests prepared by experts in each subject in the Ministry of Education. These schools were distributed throughout the country's five school districts: Al-Asemah, Hawalli, Al-Farwania, Al-Ahamadi, and Al-Jahra (Table 11). At the time the research was conducted, there were 6,096 students in these two-semester schools (Department of Planning, 2001) (see Table 12).

Table 10

Sciences and Arts Major Subjects

Sciences Major			Arts Major		
Subject	Maximum Score	Minimum Score	Subject	Maximum Score	Minimum Score
Islamic Education	40	20	Islamic Education	40	20
Arabic Language	60	30	Arabic Language	60	30
English Language	60	30	English Language	60	30
Mathematics	100	50	French Language	40	20
Physics	80	40	History	40	20
Chemistry	60	30	Geography	40	20
Biology	40	20	Philosophy	20	10
			Psychology	20	10
Sciences Curriculum Composite Score	440	220	Arts Curriculum Composite Score	320	160

Table 11

The Distribution of Two Semester Public 2-session High Schools by School District

	Al-Asemah	Hawalli	Al-Farwania	Al-Ahmadi	Al-Jahra	Total
Boys' Schools	2	6	6	9	5	28
Girls' Schools	2	5	6	10	5	28

Table 12

Number of Students in the Sciences and Arts Major in Girls' and Boys' Schools

Major	Boy Students		Girl Students		All Students	
	N	%	N	%	N	%
Sciences	1272	53.7	1496	40.0	2768	45.4
Arts	1100	46.3	2228	60.0	3328	54.6
Total	2372	39.0	3724	61.0	6096	100

Data Needs

The design of this study facilitated a comparison of student achievement with the condition of the school building. More specifically, the data needed to complete this study of the relationship between school building condition and student achievement consisted of two sets of data, which were the scores resulting from the assessment of school building condition and the mean scores on students examinations. The scores needed to determine the school building condition rating were obtained from high school principals through an instrument developed specifically for this study. For student achievement, twelfth graders' mean scores on high school examinations during the 2000-2001 school year were used to determine if the building condition rating affected student achievement scores. The mean score of each school (boys' school or girls' school), in general, for students in Sciences and Arts majors was needed, as was the mean score of all students in each school and in each academic area in the Sciences and Arts majors.

Instrument Development

The instrument of this study was based in large part on the Commonwealth Assessment of Physical Environment (CAPE) developed by Cash (1993). This revised CAPE consisted of 21 items (Appendix A). Factors included in this instrument were lighting, acoustics, climate control, color, science laboratory quality, and aesthetics. This instrument also included spaces for comments following each question. The purpose of this revised CAPE is similar to that of the original CAPE, which was to assist in the identification of the top and bottom quartile groups in terms of the scores of building on overall, structural, and cosmetic conditions (see Table 13).

Since the revised CAPE was developed in English, it had to be translated into Arabic, the native language of Kuwait (Appendix B). Arabic, the revised CAPE was then translated into Arabic (Appendix B). After being translated, the revised CAPE developed for this study was

Table 13

Structural and Cosmetic Building Condition Items on the Assessment of Building Conditions for Kuwaiti Public Secondary Schools

No	Domain	Variables	Item Number
1	Structural Building Condition (13 items)	Building Age	1
		Windows	2
		Flooring	3
		Heating	4
		Air Conditioning	5
		Roof Leaks	8
		Adjacent Facilities	9
		Ceiling Covering	14
		Science Lab Equipment	15
		Science Lab Age	16
		Lighting	17
		Wall Color	20
		Exterior Noise	21
2	Cosmetic Building Conditions (8 items)	Interior Wall Paint	6
		Exterior Wall Paint	7
		Floors Swept	10
		Floors Mopped	11
		Graffiti	12
		Graffiti Removal	13
		Classroom Furniture	18
		Grounds	19

given to three graduate student colleagues who speak both English and Arabic to confirm the accuracy of the translation. Then, the translated instrument was pre-tested with five school principals, whose schools were excluded from the sample, to ascertain whether the translated questions were still presented in clear and understandable language and to ensure that these five principals interpreted them similarly.

The five principals, who were not told that they were not participating in the actual study in order to reduce any influence this could have on their answers, were also asked to suggest changes and alternate questions that they thought might improve the instrument. The very few suggestions they did have caused a few of the response choices for some of the questions to be changed to make the instrument more applicable to Kuwaiti public high schools. For example, the English version offers seven possible choices to identify the age of a school. This range was narrowed to four on the Arabic version because the oldest high school in Kuwait was built in 1961. In another example, the questions regarding the existence of a schedule for interior and exterior painting were deleted because the principals perceived that these questions were essentially the same as questions 6 and 7, which asked about the last time the interior and exterior walls, or windows and trim were painted.

The choices of responses to question 9 (facilities adjacent to/part of the school) was changed to include some responses more applicable to Kuwaiti public secondary schools. The choices of football stadium, baseball field, tennis court, and softball field were changed to soccer field, basketball court, volleyball court, and handball court. In question 12, because not all high schools provide the students with lockers, the choice of lockers was deleted as a potential place where graffiti might commonly be found. The question of the condition of the lockers was also deleted for the same reason. The choice of wood or open beams as ceiling materials in question

14 was changed to a concrete ceiling, since that is more commonly found in Kuwaiti construction. Finally, question 26 (approximate gross square footage of the facility) and question 27 (approximate acreage of the school site) were deleted because this information is not generally available to school principals.

Each building was appraised and was assigned a score based on its condition. The data obtained from the items on the revised CAPE shown in Table 14 determined the score for overall building condition. A building could have a possible score of 21 to 63 points. The scores on each building were placed on a continuum from high to low. The schools falling in the top quartile and bottom quartiles were selected and used for comparison purposes.

The data obtained from the revised CAPE were also needed to compare student achievement among schools with facility (cosmetic and structural building) condition ratings. The cosmetic building condition could have a score of 8-24 points and the structural building condition could have a score of 13-39 points. Similarly, the scores for structural and cosmetic conditions of a building were placed on a continuum from high to low. The schools falling in the top and bottom quartiles were selected and used for comparison purposes.

Scoring

The response to each question (item) on the revised CAPE (Appendix A) was coded as a one, two, or three. An a response was coded as one, a b response as a two, and a c response coded as a three. There were four questions with more than three possible responses according to specific criteria. Question 1 (Item # 1) concerned the age the school building and included

Table 14

Procedures of Instrument Scoring

Variables	Item Number	Score		
		One	Two	Three
Structural Building Conditions				
Building Age	1	a or b	c	d
Windows	2	a	b	c
Flooring	3	a	b	c
Heating	4	a	b	c
Air Conditioning	5	a	b	c
Roof Leaks	8	a	b	c
Adjacent Facilities[a]	9	Three facilities or fewer	Four facilities	More than Four facilities
Ceiling Covering	14	a	b	c
Science Lab Equipment	15	a	b	c
Science Lab Age	16	a	b	c
Lighting	17	a	b	c
Wall Color	20	a	b	c
Exterior Noise	21	a	b	c
Cosmetic Building Conditions				
Interior Wall Paint	6	a	b	c
Exterior Wall Paint	7	a	b	c
Floors Swept	10	a	b	c
Floors Mopped	11	a	b	c
Graffiti[b]	12	Four or more areas	One or two areas	No areas
Graffiti Removal	13	a	b	c
Classroom Furniture	18	a	b	c
Grounds	19	a	b	c

Note. [a]This item refers to the number of facilities adjacent to, or part of, the school building.

[b]This item refers to the number of areas of the school building where graffiti was often found.

responses of a through d. School buildings 20 years old or older were coded as one (a and b); school buildings at least ten years old, but less than twenty years old were coded as two (c); and school buildings less than ten years old were coded as three (d).

Question 9 asked the school principals to identify the facilities adjacent to, or part of, the school building. There were five possible facilities listed under this question. The response was coded one if it indicated three or fewer adjacent facilities, two if it indicated more than three, but fewer than four adjacent facilities, and three if it indicated four or more adjacent facilities.

Question 12 asked the school principals to identify the areas of the school building where graffiti was often found. Six areas where graffiti was commonly found were listed. The response was coded one if four or more areas were listed, two if at least one but no more than three were listed, and three if no areas were listed. The reason for this coding was because the number of areas containing graffiti indicate the building condition.

Question 15 asked for more information from school principals to indicate and list utilities and equipment were available and in useable condition in the science laboratories. There were four possibilities listed under this question. The response was coded one if it indicated fewer than all four possibilities, two if all four possibilities were marked, and three if all four possibilities were marked and other additional utilities or equipment were listed.

Reliability

In order to check the reliability of the test-retest of the revised CAPE instrument, the instrument was given to five school principals randomly chosen from the ones who were not selected to be in the study. They were given the same questionnaire on two separate occasions three weeks apart to confirm the interrater reliability of the assessment instrument. The five

principals were not aware that they were participating in a pilot investigation in order to minimize variances in the answers or false responses.

The scale of the instrument was reliable for only the test-retest (see Table 15). Only two principals changed their answers for the same question, which asked how recently their science lab was updated, after consulting with some of the science teachers. However, the reliability coefficient was .635. Therefore, high interrater consistency reliability was not found due to the lack of correlation between all items on the scale.

Data Gathering

The 56 participating principals contributed to the school building condition assessment scores needed to determine the school building condition ratings using the revised CAPE. The researcher contacted and visited the 56 principals in their schools to deliver the questionnaire. An explanation was given regarding the nature of the questionnaire. The principals were asked to return the questionnaire to the researcher.

The mean scores of twelfth grade students attending Kuwaiti public high schools were collected from the Information Center at the Kuwaiti Ministry of Education. The Center was asked to provide the mean score of each student in the 2000-2001 school year. These were then used to develop the mean score for the school.

Data Analysis

Upon receipt of the completed survey instruments, descriptive statistics were run to determine the normality of distribution and skewness, and to detect outliers. The data was entered in the Statistical Package for Social Sciences (SPSS) for interpretation. The research questions were examined at the .05 level of significance. The research questions were

Table 15

Test-Retest Responses

Item	First Principal			Second Principal			Third Principal		
	First Time	Second Time	Difference	First Time	Second Time	Difference	First Time	Second Time	Difference
Building Age	2	2	0	1	1	0	2	2	0
Windows	3	3	0	3	3	0	3	3	0
Flooring	1	1	0	1	1	0	1	1	0
Heating	1	1	0	1	1	0	1	1	0
Air Conditioning	3	3	0	3	3	0	3	3	0
Roof Leaks	2	2	0	2	2	0	3	3	0
Adjacent Facilities	2	2	0	2	2	0	3	3	0
Ceiling Covering	1	1	0	1	1	0	1	1	0
Science Lab Equipment	3	3	0	3	3	0	2	2	0
Science Lab Age	2	1	1	2	2	0	2	3	1
Lighting	2	2	0	2	2	0	2	2	0
Wall Color	2	2	0	3	3	0	3	3	0
Exterior Noise	3	3	0	3	3	0	3	3	0
Interior Wall Paint	3	3	0	3	3	0	3	3	0
Exterior Wall Paint	2	2	0	1	1	0	2	2	0
Floors Swept	3	3	0	3	3	0	3	3	0
Floors Mopped	3	3	0	3	3	0	3	3	0
Graffiti	2	2	0	1	1	0	1	1	0
Graffiti Removal	2	2	0	2	2	0	2	2	0
Classroom Furniture	2	2	0	1	1	0	2	2	0
Grounds	1	1	0	1	1	0	1	1	0

table continues

Table 15 (continued)

Test-Retest Responses

Item	Fourth Principal			Fifth Principal		
	First Time	Second Time	Difference	First Time	Second Time	Difference
Building Age	2	2	0	1	1	0
Windows	3	3	0	3	3	0
Flooring	1	1	0	1	1	0
Heating	1	1	0	1	1	0
Air Conditioning	3	3	0	3	3	0
Roof Leaks	3	3	0	2	2	0
Adjacent Facilities	3	3	0	2	2	0
Ceiling Covering	1	1	0	1	1	0
Science Lab Equipment	3	3	0	3	3	0
Science Lab Age	2	1	1	2	2	0
Lighting	2	2	0	2	2	0
Wall Color	3	3	0	3	3	0
Exterior Noise	2	2	0	3	3	0
Interior Wall Paint	3	3	0	3	3	0
Exterior Wall Paint	3	3	0	1	1	0
Floors Swept	3	3	0	3	3	0
Floors Mopped	3	3	0	3	3	0
Graffiti	1	1	0	2	2	0
Graffiti Removal	2	2	0	3	3	0
Classroom Furniture	3	3	0	3	3	0
Grounds	1	1	0	1	1	0

examined using Pearson's product moment correlation, two-way factorial ANOVA, t-test, multiple regression, and step-wise multiple regression.

Research Question # 1: What is the relationship between the condition of school facilities (overall building condition, cosmetic building condition, and structural building condition) and student achievement in public high schools in the State of Kuwait?

To answer this question, the data was analyzed using Pearson's product moment correlation. The Pearson r was used to determine if there is a relationship between building condition and student achievement. That is, three main correlations were run between building condition and student achievement: the Pearson r was used to examine the relationship between the rating scores of building on overall building condition and student achievement. Second, the Pearson r was used to examine the relationship between the rating scores of building on structural building conditions and student achievement. Third, the Pearson r was used to examine the relationship between the rating scores of the building on cosmetic building conditions and student achievement. The student achievement was the average aggregate score of all students attending the particular school in Sciences or Arts major.

Research Question# 2: Does the relationship between building condition and student achievement differ between boys' and girls' schools?

Two statistical analyses were used to answer this question. First, two-way ANOVA was used to examine whether there was a statistically significant main effect for the overall, structural, and cosmetic conditions of the building on student achievement. The main effect of building condition on student achievement was examined by comparing the student achievement of the top and bottom quartiles of the schools to see if there was a significant difference in means between these two groups (see Table 16). A t-

test was then used as a follow-up test of simple significant main effect and interaction effect (see Table 17). See Appendix C for diagrammatic explanations of the grouping of buildings.

The variables that were entered in SPSS to run the two-way factorial ANOVA are building condition and gender as independent variables and student achievement as the dependent variable.

Research Question #3: What aspects of physical building conditions are related to student achievement?

Two statistical analyses were used to answer this question. First, multiple regression was used to explain how much of the variance in student achievement is explained by building conditions. Step-wise multiple regression was then used to determine the best predictors of student achievement from the different aspects of physical building conditions.

However, in most previous research studies (Cash, 1993; Earthman, Cash, &Van Berkum, 1996; Hines, 1996; Lanham, 1999), the social economic status (SES) was statistically controlled by using the number of students who participated in the free reduced lunch program to determine the SES. In all public Kuwaiti schools, there is no such way to indicate the SES of students because schools do not offer the free reduced lunch program. Therefore, the SES was not statistically controlled in this study.

Table 16

Comparing Student Achievement with Building Ratings[1] and Building Conditions[2] Using Two-Way Factorial ANOVA

		Building Conditions	
Building Ratings	Major	Top Quartile	Bottom Quartile
Overall Building Condition	Sciences	C1s	C1s
	Arts	C1a	C1a
Structural Building Condition	Sciences	C2s	C2s
	Arts	C2a	C2a
Cosmetic Building Condition	Sciences	C3s	C3s
	Arts	C3a	C3a

Note.

C1: Comparison based on the overall building condition ratings.

C2: Comparison based on the cosmetic building condition ratings.

C3: Comparison based on the structural building condition ratings.

s : Achievement of the students in the Sciences major.

a : Achievement of the students in the Arts major.

[1] Building Ratings refer to Overall Building Condition, Cosmetic Building Condition, and Structural Building Condition.

[2] Building Conditions refer to top and bottom quartiles of schools.

Table 17

Comparing Student Achievement with Building Ratings[1] and Building Conditions[2] Using T-Test

Building Ratings	Gender	Major	Building Conditions: Top Quartile	Building Conditions: Bottom Quartile
Overall Building Condition	Boys	Sciences	C1bs	C1bs
		Arts	C1ba	C1ba
	Girls	Sciences	C1gs	C1gs
		Arts	C1ga	C1ga
Structural Building Condition	Boys	Sciences	C2bs	C2bs
		Arts	C2ba	C2ba
	Girls	Sciences	C2gs	C2gs
		Arts	C2ga	C2ga
Cosmetic Building Condition	Boys	Sciences	C3bs	C3bs
		Arts	C3ba	C3ba
	Girls	Sciences	C3gs	C3gs
		Arts	C3ga	C3ga

Note.

C1: Comparison based on the overall building condition ratings.

C2: Comparison based on the cosmetic building condition ratings.

C3: Comparison based on the structural building condition ratings.

bs: Achievement of the students in the Sciences major in the boys' schools.

ba: Achievement of the students in the Arts major in the boys' schools.

gs: Achievement of the students in the Sciences major in the girls' schools.

ga: Achievement of the students in the Arts major in the girls' schools.

[1] Building Ratings refer to Overall Building Condition, Cosmetic Building Condition, and Structural Building Condition.

[2] Building Conditions refer to top and bottom quartiles of schools.

Summary

The purpose of this chapter has been to describe the methodology of this study. This study consists of a non-experimental design that has helped to explore the relationship between building condition and student achievement. This chapter also described the setting, the population, and the procedures of scoring and reliability for this study. The data needed, the process of the instrument development, the data collection procedures have been laid out in this chapter, and the methods used to analyze the data collected have been described in detail.

CHAPTER 4: FINDINGS

This chapter contains the findings of the three research questions that were used to examine the relationship between school building conditions and the academic achievement of twelfth grade students taught in Kuwaiti public high schools:

1. What is the relationship between the condition of school facilities and student achievement in public high schools in the State of Kuwait?
    a. What is the relationship between the overall condition of the facilities and student achievement?
    b. What is the relationship between the structural condition of the facilities and student achievement?
    c. What is the relationship between the cosmetic condition of the facilities and student achievement?
2. Does the relationship between building condition and student achievement differ between boys' and girls' schools?
3. What aspects of physical building conditions are related to student achievement?

The results of the statistical analyses, including descriptive statistics and inferential statistics, are included in this chapter. The section of descriptive statistics presents a summary of the schools' principals' responses to the revised Commonwealth Assessment of Physical Environment (CAPE) used in this study. The inferential statistics' section includes the results of Pearson's product moment correlation analysis, two-way factorial ANOVA, and t-test, as a follow-up tests of the main effects on student achievement, multiple regression, and step-wise multiple regression.

Descriptive Statistics

Upon completion of collecting data using the revised CAPE instrument distributed to the principals of all boys' and girls' schools, responses to all items (questions) regarding the building condition were reported in Tables 18 through 22. The responses to all items are related to both structural and cosmetic conditions. Moreover, the total building scores used to provide the range of conditions are reported in Tables 22 and 23.

Structural Condition

The 13 responses to the questions on the structural conditions of building by principals of boys' and girls' schools were summarized separately and are presented in Tables 18 through 20. The overall responses of all principals are also summarized in these tables.

All the principals' responses to some questions, as presented in Tables 18 through 20, were alike due to the traditional design of all school buildings required by the Kuwaiti Ministry of Education. Every principal reported that all classrooms had windows, tile flooring, concrete ceilings, more than four facilities adjacent to the school complex, all equipment and utilities needed in the science laboratory, and hot-fluorescent lighting. In addition, all classrooms did not have any type of heat control, but have been air-conditioned since 1996.

The first question in the revised CAPE asked principals to mark the best estimate age of their school building in years. Fifty percent reported that their school buildings were built 10 to 20 years ago, 36% that their school buildings were built 20 to 30 years ago, and 10% that the age of their school buildings were30 years old or older. Only

Table 18

Frequency Distribution of the Revised CAPE Instrument Questions Related to The Structural Building Condition

				Boys' Schools (N=28)		Girls' Schools (N=28)		All Schools (N=56)	
Item	Question	Code	Choices	N	%	N	%	N	%
1	Age of School?	1	a. 30-39 years	3	10.7	2	7.1	5	8.9
		1	b. 20-29 years	10	35.7	10	35.7	20	35.7
		2	c. 10-19 years	14	50.0	14	50.0	28	50.0
		3	d. Under 10 years	1	3.6	2	7.1	3	5.4
2	Windows in each classroom?	1	a. In fewer than$1/4^{th}$ the instructional spaces	0	0.0	0	0.0	0	0.0
		2	b. In at least $1/4^{th}$ the instructional spaces	0	0.0	0	0.0	0	0.0
		3	c. In at least $3/4^{th}$ the instructional spaces	28	100.0	28	100.0	56	100.0
3	Kind of flooring in classrooms?	1	a. Wood floor	0	0.0	0	0.0	0	0.0
		2	b. Tile or terrazzo	28	100.0	28	100.0	56	100.0
		3	c. Carpet	0	0.0	0	0.0	0	0.0
4	Quality of heat in classrooms?	1	a. Uneven heat/unable to control in each classroom	28	100.0	28	100.0	56	100.0
		2	b. Even heat/unable to control in each classroom	0	0.0	0	0.0	0	0.0
		3	c. Even heat/able to control in each classroom	0	0.0	0	0.0	0	0.0
5	Quality of air-conditioning in classrooms?	1	a. No air conditioning in the classrooms	0	0.0	0	0.0	0	0.0
		2	b. Air conditioning in some classrooms	0	0.0	0	0.0	0	0.0
		3	c. Air conditioning in all classrooms	28	100.0	28	100.0	56	100.0

Note. Code= the score assigned to each response

Table 19

Frequency Distribution of the Revised CAPE Instrument Questions Related to The Structural Building Condition

				Boys' Schools (N=28)		Girls' Schools (N=28)		All Schools (N=56)	
Item	Question	Code	Choices	N	%	N	%	N	%
8	Visible indications of roof leaks?	1	a. Ceiling deteriorating due to water damage	18	64.2	11	39.3	29	51.8
		2	b. Ceiling currently developing a few new stains due to minor leaks	5	17.9	13	46.4	18	32.1
		3	c. No visible signs or only a few old spots in ceiling	5	17.9	4	14.3	9	16.1
9	Number of facilities adjacent in the school?	1	a. Two or fewer	0	0.0	0	0.0	0	0.0
		2	b. Three	0	0.0	0	0.0	0	0.0
		3	c. Four or more	28	100.0	28	100.0	56	100.0
14	Type of interior ceiling?	1	a. Concrete tile "wall tile"	28	100.0	28	100.0	56	100.0
		2	b. Plaster or acoustical tiles in at least third/fourth of the classrooms	0	0.0	0	0.0	0	0.0
		3	c. Acoustical tiles throughout the classrooms	0	0.0	0	0.0	0	0.0
15	Number of utilities in the science lab?	1	a. Two choices	0	0.0	0	0.0	0	0.0
		2	b. Three choices	0	0.0	0	0.0	0	0.0
		3	c. Four choices or more	28	100.0	28	100.0	56	100.0

Note. Code= the score assigned to each response

Table 20

Frequency Distribution of the Revised CAPE Instrument Questions Related to The Structural Building Condition

				Boys' Schools (N=28)		Girls' Schools (N=28)		All Schools (N=56)	
Item	Question	Code	Choices	N	%	N	%	N	%
16	Last update of science equipment?	1	a. Over 10 years ago	16	57.1	10	35.7	25	44.6
		2	b. Between 5 and 10 years	9	32.1	18	64.3	28	50.0
		3	c. Less than 5 years ago or the building is less than 5 years old	3	10.7	0	0.0	3	5.4
17	Type of lighting in classrooms?	1	a. Incandescent lighting	0	0.0	0	0.0	0	0.0
		2	b. Fluorescent lighting-Hot	28	100.0	28	100.0	56	100.0
		3	c. Fluorescent lighting-Cold	0	0.0	0	0.0	0	0.0
20	Colors of classroom walls	1	a. Dark colors	3	10.7	0	0.0	3	5.4
		2	b. White colors	13	46.4	14	50.0	27	48.2
		3	c. Pastel colors	12	42.9	14	50.0	26	46.4
21	Proximity of school to any noise resources?	1	a. Yes, and no action taken to reduce the noise level	5	17.9	3	10.7	8	14.3
		2	b. Yes, and action taken to reduce the noise level	9	32.1	8	28.6	17	30.4
		3	c. No	14	50.0	17	60.7	31	55.4

Note. Code= the score assigned to each response.

5.4% reported that their school building were less than 10 years old.

Question 8 asked principals to report if there were any visible indications of roof leak. Over half of all principals reported that there were roof leaks due to water damage. About half the girls' schools' principals (46%) reported minor leaks, while 18% of the boys' schools principals reported minor leaks. Approximately one- third of boys' and girls' schools principals reported no leaks.

Question 16 asked principals to report the last time science laboratory equipment was updated. Over half of the boys' schools' principals (57%) reported that science laboratory equipment were updated over ten years ago, and less than half (32%) reported that science laboratory equipment was updated between five to ten years ago. Only three science laboratories in boys' schools were updated less than five years ago. In contrast, 35% of the girls' schools' principals reported that science laboratory equipment was updated over ten years ago, while 64.3% reported that science laboratory equipment was updated between five to ten years ago. None of the girls' schools principals reported that any science laboratory was updated less than five years ago.

Question 20 asked about the wall color in the majority of classrooms. About half of all the principals (48%) reported that classrooms had white walls, and another 46% reported that classrooms had walls painted with pastel colors. Only three boys' schools principals reported dark walls in their schools.

Question 21 asked the principals if their schools were located near a busy or major highway, near an area where aircraft pass overhead, or near any other source of loud noise. They were also asked to report measures taken to reduce the

level of noise within the facility. Half of the boys' schools principals (50%) and over half of the girls' schools principals (60.7%) reported that their schools were not located near any noise-producing environment. The approximately 30% who indicated that their schools were located near busy roads and next to a number of other schools reported that measures had been taken to reduce the noise level. A few school principals reported that their schools were located next to a noise-producing environment and no measures had been taken to reduce the level of noise.

Cosmetic Condition

The responses to the eight questions on the cosmetic conditions of the building by principals of boys' and girls' schools separately were separately summarized and are presented in Tables 21 through 22. The overall responses of all the principals are also summarized in these tables.

Question 6 asked principals to report, in years, the last time interior walls were painted. The majority of principals (82%) reported that interior walls were painted less than eight years ago and funds from the school budget were used for that purpose.

Question 7 asked principals to report, in years, when exterior walls were last painted. Over half of the boys' schools principals (53%) reported that exterior walls were painted between four and seven years ago, and over a quarter (28.6%) reported that exterior walls were painted less than four years ago. About half of the girls' schools principals (42%) reported that exterior walls were painted between four and seven years ago, and the other half reported that exterior walls were painted less than four years ago. All used funds from the school budget to finance the painting.

Table 21

Frequency Distribution of the Revised CAPE Instrument Questions Related to The Cosmetic Building Condition

				Boys' Schools (N=28)		Girls' Schools (N=28)		All Schools (N=56)	
Item	Question	Code	Choices	N	%	N	%	N	%
6	The last time interior walls were painted?	1	a. Over 15 years ago	0	0.0	0	0.0	0	0.0
		2	b. Between 8 and 15 years ago	5	17.9	5	17.9	10	17.9
		3	c. Less than 8 years ago	23	82.1	23	82.1	46	82.1
7	The last time exterior walls were painted?	1	a. Over 7 years ago	5	17.9	4	14.3	9	16.1
		2	b. Between 4 and 7 years ago	15	53.6	12	42.9	27	48.2
		3	c. Less than 4 years ago	8	28.6	12	42.9	20	35.7
10	How often are classrooms' floors swept?	1	a. Monthly	2	7.1	2	7.1	4	7.1
		2	b. Weekly	4	14.3	1	3.6	5	8.9
		3	c. Daily or more frequently	22	78.6	25	89.3	47	83.9
11	How often are classrooms' floors mopped?	1	a. Annually	1	3.6	0	0.0	1	1.8
		2	b. Monthly	9	32.1	4	14.3	13	23.2
		3	c. Weekly or daily	18	64.3	24	85.7	42	75.0
12	Number of areas with graffiti?	1	a. Four or more areas	17	60.7	11	39.3	28	50.0
		2	b. One or two areas	9	32.1	12	42.9	21	37.5
		3	c. Nothing	2	7.1	5	17.9	7	12.5

(Table Continues)

Note. Code= the score assigned to each response

Table 22

Frequency Distribution of the Revised CAPE Instrument Questions Related to The Cosmetic Building Condition

				Boys' Schools (N=28)		Girls' Schools (N=28)		All Schools (N=56)	
Item	Question	Code	Choices	N	%	N	%	N	%
13	Duration of graffiti?	1	a. Until summer maintenance or the next painting	15	53.6	11	39.3	26	46.4
			cycle	7	25.0	7	25.0	14	25.0
		2	b. More than a week, less than a month	6	21.4	10	35.7	16	28.6
		3	c. Less than a week						
18	Condition of the classroom furniture?	1	a. Most furniture is damaged	2	7.1	2	7.1	4	7.1
		2	b. Most furniture looks satisfactory	22	48.6	24	85.7	46	82.1
		3	c. Most furniture looks attractive	4	14.3	2	7.1	6	10.7
19	Condition of the school grounds?	1	a. No landscaping (unattractive to the community)	17	60.7	12	42.9	29	51.8
		2	b. There is landscaping (accepted to the community)	10	35.7	16	57.1	26	46.4
		3	c. There is landscaping ((attractive to the community)	1	3.6	0	0.0	1	1.8

Note. Code= the score assigned to each response.

Questions 10 and 11 asked principals how often classrooms floors were swept and mopped, respectively. The majority of all principals (more than 60%) reported that floors were swept daily or more frequently and mopped weekly or daily. Floors were swept weekly and mopped monthly in some schools due to the absence or shortage of custodial staff in their schools and due to also to the type of contract between the school and the cleaning company.

Questions 12 and 13 asked principals how many areas of the school contained graffiti, as well as how long did the graffiti stayed on the walls or doors. Half (50%) reported that graffiti was found on more than four areas, and more than a third (37.5%) reported that graffiti was found in fewer than two places because of restrictions and regulations implemented by the school administration. Among these surveyed, 46.4% reported that graffiti remained until the regular maintenance, usually in late summer of every year before the school opened it doors to students. However, some principals (28.6%) removed graffiti immediately, using money from the school budget, or asked students or teachers to paint walls if the graffiti contained inappropriate words.

Question 18 asked the principals to describe the condition of the classroom furniture. The majority (82.1%) reported that most furniture looked satisfactory. A few (7-10%), however, reported that classroom furniture was either damaged or looked attractive.

Question 19 concerned the condition of school grounds. Half of the principals (51%) reported that the schools grounds were not landscaped, did not have sidewalks, and were unattractive to the surrounding community. Less than half (46.4%) reported that they used the outside grounds as a parking lot for school staff and visitors and planted

planted some small trees to make the school grounds acceptable to the surrounding community.

Rating of the Range of Building Conditions

Each item on the CAPE included three responses that were coded as one for a minimum score and two or three for a maximum score, and the 21 items were summed up to derive a score ranging from a minimum score of 21 to a maximum score of 63 for overall building condition. The 13 items related to structural condition and the eight items related to cosmetic condition were added separately to arrive at structural and cosmetic sub-scores. A score ranged from a minimum of 13 to a maximum of 39 for all 13 structural conditions. A score ranged from a minimum of eight to a maximum of 24 for all eight cosmetic condition items.

Grouping of Building Scores into Categories

Frequency distributions for boys' and girls' schools were determined for each of the building condition scores- overall, structural, and cosmetic building condition. Also, for analysis purposes, each building condition was divided into three groups- top quartile, middle two quartiles, and bottom quartile. For the boys' schools (see Table 23), the building was in the top quartile if the overall building condition scores fell at or above 47; in the middle quartiles if the scores were 42 or above but below 47; and in the bottom if the scores were 38 or above but below 42. For the structural condition of boys' schools, the building was in the top quartile if the scores fell at or above 29; in the middle quartiles if the scores were 26 or above but below 29; and in the bottom if the scores were 24 or

above but below 26. For the cosmetic condition of boys' schools, the building was in the top quartile if the scores fell at or above 18; in the middle quartiles if the scores were 15 or above but below 18; and in the bottom quartile if the scores were 13 or above but below 15.

For the girls' schools (see Table 24), the building was in the top quartile if the overall building condition scores fell at or above 50; in the middle quartiles if the scores were 43 or above but below 50; and in the bottom quartile if the scores were 38 or above but below 43. For the structural condition of girls' schools, the building was in the top quartile if the scores fell at or above 30; in the middle quartiles if the scores were 27 or above but below 30; and in the bottom quartile if the scores were 25 or above but below 27. For the cosmetic condition for girls' schools, the building was in the top quartile if the scores fell at or above 21; in the middle quartiles if the scores were 17 or above but below 21; and in the bottom group if the scores were 12 or above but below 17.

Data Analysis

In order to analyze the data and answer the research questions, Pearson's product moment correlation analysis, two-way factorial ANOVA, and t-test as a follow-up test of the main effects on student achievement, multiple regression, and step-wise multiple regression were conducted in this study.

Research Question # 1: What is the relationship between the condition of school facilities (overall building condition, cosmetic building condition, and structural building condition) and student achievement in public high schools in the State of Kuwait? Three main correlation analyses were conducted to determine the relationship between the rating scores of building on overall, structural, and cosmetic building condition

Table 23

The Range of Scores of Boys' Schools in Each Category: Overall Building Condition, Structural Building Condition, and Cosmetic Building Condition

Building Condition		Top Quartile Buildings (N=7)	Middle Quartiles Buildings (N=14)	Bottom Quartile Buildings (N=7)
Overall Condition	Range	54-47	46-42	41-38
	Average	49.29	43.71	40.00
Structural Condition[a]	Range	32-29	29-26	26-24
	Average	30.43	26.93	25.00
Cosmetic Condition[b]	Range	23-18	18-15	15-13
	Average	20.00	16.79	13.86

Note. [a]Structural building condition referred to the rating of the physical structure of building, based on 13 items, on the revised CAPE. The structural items were building age, windows, flooring, heating, air-conditioning, roof leaks, adjacent facilities, ceiling covering, science lab equipment, science lab age, lighting, wall color, and exterior noise

[b]Cosmetic building condition referred to the rating of aesthetic building condition based on eight items on the revised CAPE. The cosmetic items were interior wall paint, exterior wall paint, floors swept, floors mopped, graffiti, graffiti removal, classroom furniture, and grounds.

Table 24

The Range of Scores of Girls' Schools in Each Category: Overall Building Condition, Structural Building Condition, and Cosmetic Building Condition

Building Condition		Top Quartile Buildings (N=7)	Middle Quartiles Buildings (N=14)	Bottom Quartile Buildings (N=7)
Overall Condition	Range	53-50	49-43	42-38
	Average	50.86	46.36	41.0
Structural Condition[a]	Range	31-30	29-27	26-25
	Average	30.26	28.0	25.57
Cosmetic Condition[b]	Range	23-21	21-17	17-12
	Average	21.57	18.29	14.57

Note. [a]Structural building condition referred to the rating of the physical structure of building, based on 13 items, on the revised CAPE. The structural items were building age, windows, flooring, heating, air-conditioning, roof leaks, adjacent facilities, ceiling covering, science lab equipment, science lab age, lighting, wall color, and exterior noise

[b]Cosmetic building condition referred to the rating of aesthetic building condition based on eight items on the revised CAPE. The cosmetic items were interior wall paint, exterior wall paint, floors swept, floors mopped, graffiti, graffiti removal, classroom furniture, and grounds.

and student achievement. The average aggregate score of all students attending the particular school offering both Sciences and Arts majors was used to measure student achievement.

For boys' schools, correlations between the rating scores of overall, structural, and cosmetic building conditions and student achievement in all subjects in the Sciences major ranged from .51 to .75 ($p < .05$) and indicated a strong positive relationship between these variables (see Table 25).

The correlation between the building conditions of boys' schools and the achievement of Arts majors indicated a positive relationship between these two variables. No relationship was found between building conditions and student achievement on the Islamic education, geography, and psychology subtests. For the rating scores of structural conditions and student achievement, a positive relationship existed in all subjects in the Arts major except geography and psychology (see Table 26). There was no relationship, however, between the scores of cosmetic conditions and student achievement in all subjects in the Arts major.

Interestingly enough, Tables 27 and 28 show that there was no relationship at all between the scores of girls' buildings on overall, structural and cosmetic building condition and student achievement in all subjects in both the Sciences and Arts majors.

When comparing the total group of schools in general, there was a correlation that ranged from .31 to .45 ($p. < .05$) between building condition and student achievement in all subjects in the Sciences major. However, there was weak relationship between the scores of building on overall and structural conditions and student achievement in all subjects in the Arts major. No significant relationship was found between the scores of

Table 25

Correlations between the Scores of Overall, Structural, and Cosmetic Conditions and Student Achievement in All Subjects in the Sciences Major in the Boys' Schools

	Overall Building Condition (N=28)		Structural Building Condition (N=28)		Cosmetic Building Condition (N=28)	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Islamic Education	.73	.000	.65	.000	.55	.002
Arabic Language	.70	.000	.61	.001	.54	.003
English Language	.66	.000	.57	.001	.51	.006
Mathematics	.75	.000	.64	.000	.59	.001
Physics	.72	.000	.67	.000	.53	.003
Chemistry	.70	.000	.61	.001	.54	.004
Biology	.75	.000	.62	.000	.61	.001
Sciences Curriculum Composite Score	.73	.000	.64	.000	.57	.002

p< .05.

Table 26

Correlations between the Scores of Overall, Structural, and Cosmetic Conditions and Student Achievement in All Subjects in the Arts Major in the Boys' Schools

	Overall Building Condition (N=28)		Structural Building Condition (N=28)		Cosmetic Building Condition (N=28)	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Islamic Education	.21	.274	.41	.030	-.03	.871
Arabic Language	.46	.015	.51	.005	.25	.198
English Language	.59	.001	.62	.000	.36	.060
French Language	.53	.004	.65	.000	.25	.198
History	.46	.013	.50	.006	.27	.165
Geography	.27	.162	.34	.074	.12	.555
Philosophy	.51	.006	.54	.003	.31	.109
Psychology	.33	.084	.42	.025	.14	.480
Arts Curriculum Composite Score	.55	.003	.63	.000	.29	.138

p < .05.

Table 27

Correlations between the Scores of Overall, Structural, and Cosmetic Conditions and Student Achievement in All Subjects in the Sciences Major in the Girls' Schools

	Overall Building Condition (N=28)		Structural Building Condition (N=28)		Cosmetic Building Condition (N=28)	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Islamic Education	-.03	.874	-.01	.636	.01	.935
Arabic Language	-.01	.978	-.12	.533	.07	.716
English Language	.03	.875	-.11	.572	.12	.554
Mathematics	-.04	.816	-.17	.386	.04	.820
Physics	-.05	.792	-.16	.420	.02	.884
Chemistry	-.12	.526	-.24	.229	-.25	.898
Biology	-.01	.963	-.14	.491	.07	.705
Sciences Curriculum Composite Score	-.04	.838	-.17	.402	.04	.803

p < .05.

Table 28

Correlations between the Scores of Overall, Structural, and Cosmetic Conditions and Student Achievement in All Subjects in the Arts Major in the Girls' Schools

	Overall Building Condition (N=28)		Structural Building Condition (N=28)		Cosmetic Building Condition (N=28)	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Islamic Education	.01	.961	-.05	.788	.05	.807
Arabic Language	-.09	.645	-.27	.167	.05	.821
English Language	-.09	.636	-.18	.358	-.02	.936
French Language	-.15	.445	-.14	.471	-.12	.538
History	.01	.974	-.13	.511	.09	.636
Geography	.02	.993	-.06	.750	.06	.744
Philosophy	.03	.870	-.06	.780	.08	.679
Psychology	-.11	.573	-.20	.316	-.03	.878
Arts Curriculum Composite Score	-.06	.747	-.17	.397	.02	.930

p < .05.

building on cosmetic building conditions and student achievement in all subjects except history and philosophy in the Arts major (see Tables 29 and 30).

Research Question# 2: Does the relationship between building condition and student achievement differ between boys' and girls' schools?

Two statistical analyses were used to answer this question. First, two-way factorial ANOVA was used to examine whether there was a statistically significant main effect for the overall, structural, and cosmetic conditions of the building on student achievement. The main effect of building condition on student achievement was examined by comparing the student achievement of the top and bottom quartile of the schools to see if there was a significant difference in means between these two groups. The main effect of each building condition-- overall, structural, and cosmetic condition-- was computed.

Secondly, a t-test was used as a follow-up test of simple significant main effect and interaction effect. This was done in order to probe the significance of the main effect of building condition-- overall, structural, and cosmetic conditions-- on student achievement. This follow-up test also helped to evaluate the significant interaction effect of building condition and gender on student achievement. More specifically, the simple main effects analyses were conducted for building condition (difference in means between the top quartile and the bottom quartile) within boys' and girls' schools. This study, however, did not examine the differences in means between the boys' schools and girls' schools within the top and bottom quartiles of schools. The t-test mainly was conducted to examine if there was a difference in means between the top and bottom

Table 29

Correlations between the Scores of Overall, Structural, and Cosmetic Conditions and Student Achievement in All Subjects in the Sciences Major in All Schools

	Overall Building Condition (N=56)		Structural Building Condition (N=56)		Cosmetic Building Condition (N=56)	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Islamic Education	.39	.003	.34	.010	.33	.014
Arabic Language	.43	.001	.35	.008	.38	.004
English Language	.43	.001	.35	.008	.38	.003
Mathematics	.45	.001	.37	.006	.39	.006
Physics	.45	.001	.40	.002	.36	.003
Chemistry	.38	.004	.33	.013	.31	.019
Biology	.42	.000	.38	.004	.42	.001
Sciences Curriculum Composite Score	.45	.000	.38	.004	.37	.003

p < .05.

Table 30

Correlations between the Scores of Overall, Structural, and Cosmetic Conditions and Student Achievement in All Subjects in the Arts Major in All Schools

	Overall Building Condition (N=56)		Structural Building Condition (N=56)		Cosmetic Building Condition (N=56)	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Islamic Education	.27	.043	.27	.045	.20	.139
Arabic Language	.31	.019	.27	.044	.26	.054
English Language	.35	.009	.34	.010	.26	.053
French Language	.27	.042	.34	.012	.15	.263
History	.35	.008	.32	.015	.27	.042
Geography	.28	.034	.27	.046	.22	.105
Philosophy	.37	.006	.33	.014	.30	.026
Psychology	.27	.042	.24	.071	.22	.100
Arts Curriculum Composite Score	.35	.008	.34	.10	.33	.013

p < .05.

quartile group for each condition- overall, structural, and cosmetic condition- between the boys' schools and girls' schools separately.

Overall Building Condition

A 2 (Overall Building Condition-Top Quartile of Schools/Bottom Quartile of Schools) X 2 (Gender) analysis of variance of student achievement, identified as the dependent variable, yielded a significant main effect for the overall building condition on all subjects in the Sciences major except chemistry. However, in general, there was a significant main effect for the overall building condition on the Sciences curriculum composite score [F (1,24)=7.00, $p < .05$]. Moreover, a significant main effect for gender was found in all Sciences subjects. A significant interaction between the overall building condition and gender was found for all subjects in the Sciences major except Islamic education, Arabic language, and English language (see Table 31).

The t-test test was conducted as a follow-up for the simple main effect of overall condition on student achievement in all subjects in the Sciences major for the boys' and girls' schools separately. Although the girls' schools in most subjects scored higher than the boys' schools in the top and bottom quartiles, the t-test indicated that there were significant differences in all subjects in the Sciences major among only the boys' schools. Table 32 shows that the top quartile of the boys' schools scored significantly higher than the bottom quartile.

However, the two-way factorial analysis of variance with student achievement, identified as the dependent variable, did not yield a significant main effect for the overall building condition in all subjects in the Arts major. Moreover, a significant main effect for gender was found in all subjects in the Arts major. A significant interaction between

Table 31

Comparing Student Achievement in All the Subjects in the Sciences Major with Overall Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using Two-Way Factorial ANOVA

	Building Condition						Gender		Interaction	
	Top Quartile (N=14)		Bottom Quartile (N=14)							
Achievement	*M*	*SD*	*M*	*SD*	*F*	*p*	*F*	*p*	*F*	*p*
Islamic Education	30.37	2.79	28.30	3.98	7.05	.014	44.33	.000	3.98	.057
Arabic Language	40.36	4.66	36.38	6.06	5.63	.026	11.21	.003	3.63	.069
English Language	42.30	6.47	35.64	8.42	7.91	.010	9.71	.005	3.78	.064
Mathematics	57.22	11.51	47.16	13.15	6.16	.020	5.70	.025	4.89	.037
Physics	52.03	8.61	43.89	10.97	7.01	.014	8.70	.007	5.55	.027
Chemistry	39.54	6.98	35.05	8.12	3.73	.065	9.89	.004	5.65	.026
Biology	28.30	4.18	24.42	5.91	8.23	.008	23.40	.000	5.97	.022
Sciences Curriculum Composite Score	290.36	43.84	249.82	57.03	7.00	.014	11.53	.002	5.42	.029

Note. *df* =1,24
p < .05.

Table 32

Comparing Student Achievement in All subjects in the Sciences Major with Overall Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using T-Test as A Follow-Up Test of Main Effect for the Overall Building Condition among the Boys' and Girls' Schools

Follow-Up Tests of Simple Main Effect

	Boys' Schools						Girls' Schools					
	Top Quartile (N=7)		Bottom Quartile (N=7)				Top Quartile (N=7)		Bottom Quartile (N=7)			
Achievement	*M*	*SD*	*M*	*SD*	*t*	*p*	*M*	*SD*	*M*	*SD*	*t*	*p*
Islamic Education	28.55	2.48	24.92	2.26	2.56	.014	32.18	1.75	31.67	1.63	.56	.580
Arabic Language	39.15	5.53	31.99	2.78	3.05	.014	41.56	3.60	40.78	5.18	.32	.749
English Language	40.91	7.97	29.66	4.10	3.31	.009	43.68	4.76	41.63	7.30	.62	.544
Mathematics	59.87	14.78	37.85	3.72	3.30	.014	57.57	8.27	56.48	12.58	.19	.851
Physics	51.12	10.69	35.73	5.74	3.35	.008	52.99	6.67	52.05	8.52	.21	.830
Chemistry	38.64	8.53	28.64	2.59	2.96	.021	40.43	5.56	41.46	6.35	-.32	.752
Biology	26.68	4.98	19.50	1.85	3.57	.008	29.92	2.63	29.34	3.98	.31	.756
Sciences Curriculum Composite Score	282.18	54.55	205.97	23.78	3.38	.009	298.54	32.13	293.66	44.68	.23	.819

$p < .05$.

the overall building condition and gender was not found for all subjects in the Arts major (see Table 33).

The t-test test was conducted as a follow-up for the simple main effect of overall condition on student achievement in all subjects in the Arts major for boys' and girls' schools separately. Although the girls' schools in most subjects in the Arts major scored higher than the boys' schools in the top and bottom quartiles, the t-test indicated that there were no significant differences in all Arts subjects except philosophy among the boys' and all subjects in the Arts major among the girls' schools (see Table 34).

Structural Building Condition

A 2 (Structural Building Condition-Top Quartile of Schools/Bottom Quartile of Schools) X 2 (Gender) analysis of variance of student achievement, identified as the dependent variable, yielded a significant main effect for the structural building condition on all subjects in the Sciences major except Arabic and English languages and chemistry. However, in general, there was a significant main effect for the structural building condition on the Sciences curriculum composite score [F (1,24)=4.98, $p < .05$]. Moreover, a significant main effect for gender was found in all subjects in the Sciences major except mathematics. A significant interaction between the structural building condition and gender was found for all subjects in the Sciences major (see Table 35).

The t-test was conducted as a follow-up test for the simple main effect of structural condition on student achievement in all subjects in the Sciences major for boys' and girls' schools. Although the girls' schools in most subjects in the Sciences major except mathematics scored higher than the boys' schools in the top and bottom quartiles, the t-test indicated that there were significant differences in all subjects in the Sciences

Table 33

Comparing Student Achievement in All the Subjects in the Arts Major with Overall Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using Two-Way Factorial ANOVA

	Building Condition						Gender		Interaction	
	Top Quartile (N=14)		Bottom Quartile (N=14)							
Achievement	*M*	*SD*	*M*	*SD*	*F*	*p*	*F*	*p*	*F*	*p*
Islamic Education	26.67	3.12	26.02	3.14	.93	.342	55.35	.000	.32	.572
Arabic Language	33.34	2.81	32.06	3.39	1.60	.217	10.01	.004	1.68	.207
English Language	32.95	5.19	30.12	6.93	2.11	.159	10.27	.004	2.45	.130
French Language	23.08	2.38	21.99	3.04	1.60	.217	11.53	.002	2.19	.152
History	26.28	2.37	24.79	2.50	3.50	.073	9.41	.005	1.52	.228
Geography	27.52	2.10	26.76	2.62	1.04	.317	13.59	.001	.28	.597
Philosophy	11.06	1.71	10.14	1.96	3.76	.064	29.82	.000	2.13	.157
Psychology	13.75	1.42	13.33	1.66	1.68	.206	60.47	.000	.71	.408
Arts Curriculum Composite Score	194.97	18.62	185.43	23.57	.12	.098	21.74	.000	2.01	.077

Note. df =1,24
$p < .05$.

Table 34

Comparing Student Achievement in All Subjects in the Arts Major with Overall Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using T-Test as A Follow-Up Test of Main Effect for the Overall Building Condition among the Boys' and Girls Schools

Follow-Up Tests of Simple Main Effect												
	Boys' Schools						Girls' Schools					
	Top Quartile (N=7)		Bottom Quartile (N=7)				Top Quartile (N=7)		Bottom Quartile (N=7)			
Achievement	*M*	*SD*	*M*	*SD*	*t*	*p*	*M*	*SD*	*M*	*SD*	*t*	*p*
Islamic Education	24.35	1.83	23.31	1.39	1.19	.254	29.00	2.27	28.73	1.53	.25	.800
Arabic Language	32.40	3.29	29.82	1.90	1.79	.098	34.28	2.05	34.31	3.10	-.02	.985
English Language	31.36	6.03	25.47	4.83	2.01	.067	34.5	4.01	34.77	5.50	-.08	.932
French Language	22.26	2.65	19.90	1.38	2.08	.059	23.90	1.92	24.09	2.82	-.14	.890
History	25.55	2.80	23.07	1.88	1.94	.076	27.01	1.77	26.50	1.79	.53	.605
Geography	26.34	1.99	25.18	2.40	.98	.344	28.69	1.55	28.33	1.84	.39	.698
Philosophy	10.11	1.41	8.50	8.50	2.63	.022	12.01	1.49	11.78	1.20	.31	.760
Psychology	12.63	1.06	11.94	0.80	1.37	.197	14.87	0.56	14.73	0.90	.36	.722
Arts Curriculum Composite Score	185.36	18.43	167.41	11.99	2.16	.052	204.58	14.02	203.45	17.39	.13	.896

p < .05.

Table 35

Comparing Student Achievement in All Subjects in the Sciences Major with Structural Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using Two-Way Factorial ANOVA

	Building Condition						Gender		Interaction	
	Top Quartile (N=14)		Bottom Quartile (N=14)							
Achievement	*M*	*SD*	*M*	*SD*	*F*	*p*	*F*	*p*	*F*	*p*
Islamic Education	30.27	2.29	28.49	3.83	5.63	.026	36.41	.000	5.60	.026
Arabic Language	39.85	4.29	36.52	5.89	4.05	.055	7.48	.012	4.60	.042
English Language	41.14	5.92	36.51	8.24	3.80	.063	5.00	.035	4.90	.037
Mathematics	56.54	10.54	48.37	12.05	4.63	.042	2.73	.111	6.26	.020
Physics	51.58	7.85	44.44	10.54	5.85	.024	5.59	.026	7.18	.013
Chemistry	39.47	5.81	35.92	7.42	2.93	.100	5.39	.029	8.91	.006
Biology	29.96	3.97	25.03	5.36	4.73	.040	16.54	.000	5.12	.033
Sciences Curriculum Composite Score	287.08	39.05	254.26	53.83	4.98	.035	7.12	013	6.88	.015

Note. *df* =1,24
p < *.05.*

major among only the boys' schools. Table 36 shows that the top quartile of the boys' schools scored significantly higher than bottom quartile. However, the girls' schools scored better but not significantly under bottom quartile than top quartile.

The two-way factorial analysis of variance of student achievement, identified as the dependent variable, did not yield a significant main effect for the structural building condition on all subjects in the Arts major. However, a significant main effect for gender was found in all subjects in the Arts major. A significant interaction between the structural building condition and gender was not found for all subjects in the Arts major, except English language and French language (see Table 37), but a significant interaction between the structural building condition and gender was found for the Arts curriculum composite score [F (1,24)=5.36, $p < .05$].

The t-test was conducted as a follow-up test for the simple main effect of structural condition on student achievement in all subjects in the Arts major for the boys' and girls' schools separately. Although the girls' schools in most subjects in the Arts major scored higher than the boys' schools in the top and bottom quartiles, the t-test indicated that there were no significant differences in all subjects in the Arts major among the girls' schools and all subjects in the boys' schools except, English language, French language, and philosophy. Table 38 shows that the top quartile of the girls' schools scored lower than the bottom quartile in most subjects in the Arts major.

Cosmetic Building Condition

A 2 (Cosmetic Building Condition-Top Quartile of Schools/Bottom Quartile of Schools) X 2 (Gender) analysis of variance of student achievement, identified as the dependent variable, yielded a significant main effect for the cosmetic building condition

Table 36

Comparing Student Achievement in All Subjects in the Sciences Major with Structural Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using T-Test as A Follow-Up Test of Main Effect for the Structural Building Condition among the Boys' and Girls' Schools

Follow-Up Tests of Simple Main Effect												
	Boys' Schools						Girls' Schools					
	Top Quartile (N=7)		Bottom Quartile (N=7)				Top Quartile (N=7)		Bottom Quartile (N=7)			
Achievement	*M*	*SD*	*M*	*SD*	*t*	*p*	*M*	*SD*	*M*	*SD*	*t*	*p*
Islamic Education	28.89	2.29	25.34	2.65	2.68	.020	31.64	1.32	31.64	1.30	.01	.996
Arabic Language	39.36	5.28	32.49	3.40	2.89	.016	40.34	3.39	40.56	5.05	-.09	.926
English Language	41.12	7.67	31.23	6.42	2.6	.023	41.17	4.13	41.80	6.37	-.21	.830
Mathematics	58.16	13.27	40.47	6.38	3.17	.012	54.93	7.66	56.26	11.33	-.25	.806
Physics	52.05	9.67	36.98	7.26	3.29	.006	51.12	6.27	51.89	7.64	-.20	.840
Chemistry	40.16	6.75	30.40	3.96	3.29	.008	38.78	5.15	41.43	5.73	-.90	.381
Biology	26.74	4.89	20.76	2.90	2.78	.020	29.17	2.62	29.29	3.39	-.07	.942
Sciences Curriculum Composite Score	286.75	49.21	215.36	34.47	3.14	.010	287.41	29.72	293.17	39.49	-.30	.763

p < .05.

Table 37

Comparing Student Achievement in All Subjects in the Arts Major with Structural Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using Two-Way Factorial ANOVA

	Building Condition						Gender		Interaction	
	Top Quartile (N=14)		Bottom Quartile (N=14)							
Achievement	*M*	*SD*	*M*	*SD*	*F*	*p*	*F*	*p*	*F*	*p*
Islamic Education	26.50	2.57	26.24	3.20	.21	.644	71.59	.000	2.17	.154
Arabic Language	32.90	2.73	32.38	3.49	.28	.601	10.42	.004	3.28	.083
English Language	32.45	3.39	30.28	5.97	2.00	.170	5.59	.026	7.60	.011
French Language	22.95	1.95	21.70	2.57	2.79	.108	6.54	.017	4.52	.044
History	25.89	2.22	25.13	2.32	1.00	.326	5.97	.022	3.85	.061
Geography	27.14	1.74	26.82	2.41	.234	.633	12.07	.002	1.31	.263
Philosophy	10.82	1.36	10.31	1.85	1.76	.197	39.65	.000	3.70	.066
Psychology	13.66	1.18	13.43	1.63	.72	.404	76.39	.000	3.00	.096
Arts Curriculum Composite Score	192.56	14.56	186.51	21.74	.40	.248	19.22	.000	5.36	.029

Note. df =1,24
$p < .05$.

Table 38

Comparing Student Achievement in All Subjects in the Arts Major with Structural Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using T-Test as A Follow-Up Test of Main Effect for the Structural Building Condition among the Boys' and Girls' Schools

Follow-Up Tests of Simple Main Effect												
	Boys' Schools						Girls' Schools					
	Top Quartile (N=7)		Bottom Quartile (N=7)				Top Quartile (N=7)		Bottom Quartile (N=7)			
Achievement	*M*	*SD*	*M*	*SD*	*t*	*p*	*M*	*SD*	*M*	*SD*	*t*	*p*
Islamic Education	24.52	1.86	23.42	1.25	1.29	.219	28.48	1.30	29.05	1.50	-.75	.463
Arabic Language	32.20	3.38	29.90	1.77	1.59	.137	33.59	1.89	34.86	2.98	-.94	.364
English Language	32.75	4.63	26.35	4.28	2.68	.020	32.15	1.78	34.21	4.78	-1.06	.307
French Language	22.79	2.64	19.96	1.33	2.53	.026	23.11	1.12	23.45	2.34	-.34	.736
History	25.71	2.90	23.47	1.73	1.74	.106	26.07	1.49	26.79	1.49	-.90	.381
Geography	26.37	2.06	25.29	2.21	.94	.364	27.92	.95	28.35	1.50	-.65	.525
Philosophy	9.98	1.32	8.74	0.66	2.21	.047	11.65	.80	11.88	1.10	-.43	.668
Psychology	12.71	.082	12.02	0.79	1.61	.133	14.61	.49	14.84	.69	-.73	.475
Arts Curriculum Composite Score	187.27	17.97	169.37	10.76	2.26	.043	197.85	8.42	203.65	14.93	-.89	.389

p < .05.

on all subjects in the Sciences major except Islamic education and chemistry. However, in general, there was a significant main effect for the cosmetic building condition on the Sciences curriculum composite score [F (1,24)=6.68, $p < .05$]. Moreover, a significant main effect for gender was found in all subjects in the Sciences major. No significant interaction between the cosmetic building condition and gender was found for all subjects in the Sciences major (see Table 39).

The t-test test was conducted as a follow-up for the simple main effect of cosmetic condition on student achievement in all subjects in the Sciences major for the boys' and girls' schools separately. Although the girls' schools in most subjects in the Sciences major scored higher than the boys' schools in the top and bottom quartiles, the t-test indicated that there were significant differences in all subjects in the Sciences major, except chemistry, among only the boys' schools. Table 40 shows that the top quartile of the boys' schools scored significantly higher than the bottom quartile in most subjects in the Sciences major.

The two-way factorial analysis of variance of student achievement, identified as the dependent variable, did not yield a significant main effect for the cosmetic building condition on any subject in the Arts major. A significant main effect for gender was found in all subjects in the Arts major. A significant interaction between the cosmetic building condition and gender, however, was not found for any subject in the Arts major (see Table 41).

The t-test was conducted as a follow-up test for the simple main effect of cosmetic condition on student achievement in all subjects in the Arts major for the boys' and girls' schools separately. Although the girls' schools in most subjects in the Arts

Table 39

Comparing Student Achievement in All Subjects in the Sciences Major with Cosmetic Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using Two-Way Factorial ANOVA

	Building Condition						Gender		Interaction	
	Top Quartile (N=14)		Bottom Quartile (N=14)							
Achievement	*M*	*SD*	*M*	*SD*	*F*	*p*	*F*	*p*	*F*	*p*
Islamic Education	29.91	2.84	28.52	3.58	3.80	.063	49.77	.000	2.57	.122
Arabic Language	39.55	4.81	35.88	4.59	6.48	.018	13.39	.001	2.11	.159
English Language	41.34	6.42	35.28	6.34	8.85	.007	10.73	.003	1.75	.198
Mathematics	55.56	11.41	46.66	9.49	6.08	.021	5.20	.032	2.24	.147
Physics	50.45	8.54	43.89	9.09	5.39	.029	9.76	.005	2.37	.136
Chemistry	38.98	6.76	35.06	6.28	3.67	.067	12.08	.002	1.76	.197
Biology	27.53	4.39	24.24	5.08	7.14	.013	27.61	.000	3.43	.076
Sciences Curriculum Composite Score	283.61	43.65	248.49	45.05	6.68	.016	12.97	.001	2.61	.119

Note. *df* =1,24
p < .05.

Table 40

Comparing Student Achievement in All Subjects in the Sciences Major with Cosmetic Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using T-Test as A Follow-Up Test of Main Effect for the Cosmetic Building Condition among the Boys' and Girls' Schools

Follow-Up Tests of Simple Main Effect												
	Boys' Schools						Girls' Schools					
	Top Quartile (N=7)		Bottom Quartile (N=7)				Top Quartile (N=7)		Bottom Quartile (N=7)			
Achievement	*M*	*SD*	*M*	*SD*	*t*	*p*	*M*	*SD*	*M*	*SD*	*t*	*p*
Islamic Education	27.97	2.43	25.43	1.79	2.21	.047	31.86	1.66	31.61	1.52	.28	.777
Arabic Language	37.96	5.37	32.19	1.52	2.73	.029	41.15	3.92	39.57	3.42	.80	.438
English Language	39.35	7.18	30.60	3.05	2.96	.018	43.33	5.33	39.97	5.15	1.19	.254
Mathematics	54.14	14.37	39.84	4.94	2.48	.040	56.97	8.42	53.48	7.89	.80	.439
Physics	48.22	10.43	37.29	6.24	2.37	.039	52.69	6.12	50.48	6.20	.67	.516
Chemistry	36.78	8.22	30.14	3.16	1.99	.083	41.18	4.50	39.97	4.36	.50	.621
Biology	25.43	4.90	19.85	1.61	2.86	.023	29.63	2.75	28.62	2.90	.66	.516
Sciences Curriculum Composite Score	270.13	52.38	213.03	23.70	2.62	.029	297.09	30.99	283.96	30.03	.80	.437

p < .05.

Table 41

Comparing Student Achievement in All Subjects in the Arts Major with Cosmetic Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using Two-Way Factorial ANOVA

	Building Condition						Gender		Interaction	
	Top Quartile (N=14)		Bottom Quartile (N=14)							
Achievement	*M*	*SD*	*M*	*SD*	*F*	*p*	*F*	*p*	*F*	*p*
Islamic Education	26.36	3.31	26.23	2.68	.03	.849	58.40	.000	.32	.572
Arabic Language	33.12	2.87	32.05	2.24	1.58	.220	10.50	.003	.09	.763
English Language	32.18	4.88	30.08	4.98	1.56	.223	7.52	.011	.66	.424
French Language	22.49	2.25	22.12	2.57	.19	.662	6.99	.014	.48	.493
History	26.01	2.28	25.24	2.42	.932	.344	8.24	.008	.02	.874
Geography	27.06	2.26	26.56	2.49	.492	.490	18.62	.000	.00	.925
Philosophy	10.85	1.83	10.24	1.44	1.74	.199	24.03	.000	.02	.870
Psychology	13.50	1.55	13.18	1.52	1.31	.264	91.39	.000	.09	.764
Arts Curriculum Composite Score	191.86	18.34	185.94	18.67	1.26	.271	21.87	.000	.16	.693

Note. *df* =1,24

major scored higher than the boys' schools in the top and bottom quartiles, the t-test indicated that there were no significant differences in any subject in the Arts major within boys' and girls' schools (see Table 42).

Question #3: What aspects of physical building conditions are related to student achievement?

Two statistical techniques were used to answer this question. First, multiple regression was used to determine how much the building condition explained student achievement. Then, step-wise multiple regression was then used to determine the best predictor(s) of building conditions that explained student achievement.

Although there were 21 predictors regarding building condition that could have explained student achievement in the Sciences major, only13 predictors were used in the multiple regression analyses. These were the rank of school age, roof leaks, the age of the science lab, wall color, exterior noise control, years since last interior painting, years since last exterior painting, sweeping frequency, mopping frequency, numbers of areas containing graffiti, duration that the graffiti remained on walls, the condition of furniture, and the condition of school grounds. The other eight predictors were not used because all schools obtained the same score on them. These eight were the number of classrooms with and without windows, floor type, heating control, air-conditioning, facilities adjacent to the school complex, ceiling type, utilities and equipment available in the science laboratory, and lighting type.

However, in order to determine how much the building condition explained student achievement in the Arts major, only 12 of the 13 predictors used in the case of student achievement in the Science major were used in the multiple regression analyses.

Table 42

Comparing Student Achievement in All Subjects in the Arts Major with Cosmetic Building Condition Rating and Building Conditions-Top Quartile and Bottom Quartile Using T-Test as A Follow-Up Test of Main Effect for the Cosmetic Building Condition among the Boys' and Girls' Schools

Follow-Up Tests of Simple Main Effects												
	Boys' Schools						Girls' Schools					
	Top Quartile (N=7)		Bottom Quartile (N=7)				Top Quartile (N=7)		Bottom Quartile (N=7)			
Achievement	*M*	*SD*	*M*	*SD*	*t*	*p*	*M*	*SD*	*M*	*SD*	*t*	*p*
Islamic Education	23.73	1.66	23.97	1.60	-.27	.786	28.98	2.23	28.49	1.06	.52	.610
Arabic Language	31.87	3.20	30.55	1.92	.93	.368	34.36	2.02	33.55	1.40	.86	.403
English Language	30.56	5.19	27.10	4.51	1.33	.208	33.79	4.30	33.06	3.57	.34	.735
French Language	21.68	2.02	20.73	2.04	.86	.402	23.30	2.31	23.51	2.37	-.16	.870
History	24.93	2.31	24.03	2.51	.69	.500	27.10	1.78	26.45	1.73	.68	.507
Geography	25.51	1.69	25.08	2.46	.37	.712	28.61	1.62	28.05	1.50	.67	.516
Philosophy	9.76	1.50	9.07	1.04	.99	.342	11.93	1.51	11.40	.53	.87	.398
Psychology	12.22	1.06	11.81	.53	.88	.398	14.78	.53	14.54	.65	.72	.481
Arts Curriculum Composite Score	180.62	15.16	172.59	14.72	1.00	.335	203.11	14.29	199.29	11.09	.55	.587

The age of the science laboratory was not used as predictor for student achievement in the Art major, because students in the Art major do not use the science laboratory.

The Explanation of Student Achievement from the Overall Building Condition

Six main multiple regression analyses were conducted to determine how much the overall building condition explained student achievement in all subjects in the Sciences and Arts majors. One included the 13 building conditions that represented the overall condition of boys' schools as predictors accounting for student achievement in all subjects in the Sciences major. All the bivariate correlations between the overall condition of boys' schools and student achievement in all Sciences major subjects were positive, and all were statistically significant ($p < .05$). The overall condition of boys' schools accounted for at least 77% of the variance of the student achievement in Islamic education and as much as 84% in mathematics. On the Sciences curriculum composite score, the building condition accounted for 83% of the variance in student achievement (see Table 43). The lack of appropriate socioeconomic status indices that could be introduced into the formula resulted in a heavier weighting given to the remaining variables than would ordinarily have been given if a SES index were available. Consequently the statistical results, although correct, need to be accepted with this understanding.

The second analysis included the 13 building conditions that represented the overall condition of girls' schools as predictors of student achievement in all Sciences major subjects (see Table 43). Although all the bivariate correlations between the overall condition of girls' schools and student achievement in all these subjects were positive, none of them was statistically significant.

Table 43

Multiple Regression Analysis for the Explanation of Student Achievement in All Subjects in the Sciences Major from the Overall Condition of Boys' and Girls' Schools

Major	Achievement	Boys' Schools (N=28)				Girls' Schools (N=28)			
		R	R^2	*F*	*p*	*R*	R^2	*F*	*p*
Science[a]	Islamic Education	.88	.77	3.77	.010	.31	.09	.37	.888
	Arabic Language	.88	.78	4.00	.007	.36	.13	.52	.784
	English Language	.89	.79	4.15	.006	.40	.16	.69	.660
	Mathematics	.91	.84	5.87	.001	.28	.08	.31	.922
	Physics	.89	.79	4.17	.006	.28	.08	.31	.923
	Chemistry	.89	.79	4.22	.006	.22	.04	.17	.980
	Biology	.91	.83	5.54	.002	.36	.13	.53	.775
	Sciences Curriculum Composite Score	.91	.83	5.47	.002	.30	.09	.35	.90

[a] *df* =13 (Regression), 14 (residual).

The third analysis included the 12 building conditions that represented the overall condition of the boys' schools as predictors of student achievement in all subjects in the Arts major. Although all the bivariate correlations between the overall condition of the boys' schools and student achievement were positive, none of them was statistically significant, except student achievement in philosophy (F (12,15)=2.72, p= .035). The overall condition of the boys' schools explained 68% of the variance of the student achievement in philosophy (see Table 44).

The fourth analysis included the 12 building conditions that represented the overall condition of the girls' schools as predictors of student achievement in all subjects in the Arts major (see Table 44). Although all the bivariate correlations between the overall condition of the girls' schools and student achievement were positive, none of them was statistically significant (p. < .05).

The fifth analysis included the 13 building conditions that represented the overall condition of all schools as predictors of student achievement in all subjects in the Sciences major. All the bivariate correlations between the overall condition of all schools and student achievement were positive, and all of them were statistically significant (p < .05). The overall condition of all schools explained at least 68% of the variance of the student achievement in Islamic education and as much as 79% in English (see Table 45).

The last analysis included the 12 building conditions that represented the overall condition of all schools as predictors of student achievement in all subjects in the Arts major. Significant correlations between the overall condition of all schools and student achievement in all subjects were not found (see Table 45).

The last two analyses indicated that the overall building condition, in

Table 44

Multiple Regression Analysis for the Explanation of Student Achievement in All Subjects in the Arts Major from the Overall Condition of Boys' and Girls' Schools

		Boys' Schools (N=28)				Girls' Schools (N=28)			
Major	Achievement	*R*	R^2	*F*	*p*	*R*	R^2	*F*	*p*
Art[b]	Islamic Education	.64	.41	.88	.570	.44	.19	.30	.978
	Arabic Language	.76	.58	1.74	.150	.69	.47	1.14	.394
	English Language	.75	.57	1.69	.166	.69	.48	1.18	.371
	French Language	.74	.55	1.55	.200	.67	.45	1.02	.474
	History	.61	.38	.77	.670	.66	.44	1.01	.481
	Geography	.57	.33	.62	.790	.74	.55	1.52	.216
	Philosophy	.82	.68	2.72	.030	.58	.34	.66	.763
	Psychology	.61	.37	.75	.680	.57	.33	.61	.800
	Arts Curriculum Composite Score	.73	.53	1.45	.24	.662	.439	.97	.508

[b] *df* =12 (Regression), 15 (residual).

Table 45

Multiple Regression Analysis for the Explanation of Student Achievement in All Subjects in the Sciences and Arts Majors from the Overall Condition of all Schools

		All Schools (N=56)			
Major	Achievement	*R*	R^2	*F*	*p*
Sciences[a]	Islamic Education	.68	.46	2.82	.005
	Arabic Language	.74	.55	4.05	.000
	English Language	.79	.63	5.61	.000
	Mathematics	.77	.60	4.92	.000
	Physics	.74	.56	4.10	.000
	Chemistry	.75	.57	4.29	.000
	Biology	.73	.53	3.75	.001
	Sciences Curriculum Composite Score	.77	.59	4.74	.000
Arts[b]	Islamic Education	.48	.23	1.10	.384
	Arabic Language	.56	.31	1.67	.107
	English Language	.62	.38	2.25	.026
	French Language	.55	.30	1.60	.126
	History	.53	.28	1.41	.197
	Geography	.51	.26	1.28	.262
	Philosophy	.57	.33	1.81	.077
	Psychology	.48	.23	1.09	.390
	Arts Curriculum Composite Score	.57	.33	1.77	.084

[a] *df* =13 (Regression), 42 (residual).
[b] *df*= 12 (Regression), 43 (residual).

general, made a significant contribution to student achievement in most subjects in the Science major only.

Best Predictors of Building Conditions Explained Student Achievement

The step-wise multiple regression was conducted to determine the best predictors of building condition that made a significant contribution to student achievement. Six main step-wise regression analyses were performed for this purpose using only the building conditions that were significantly and positively correlated with student achievement (see Appendix D). Any building condition that did not correlated positively and significantly with student achievement was removed from the regression equation to determine the best predictors, because this correlation led to inconclusive results that did not make any sense. For example, it was found, in general, that there was a significant negative relationship between the response to the age of the school building and student achievement. This meant that when the principals ranked their school buildings as older, the student achievement in these schools was high. The first analysis examined the conditions of boys' schools as predictors of student achievement in all subjects in the Sciences major. Three main conditions were found to be significant predictors (number of areas containing graffiti, roof leaks, and duration that graffiti remained on the walls) in explaining student achievement in boys' schools (see Table 46). The variable related to number of areas containing graffiti accounted for 45% of the variance of the overall Sciences curriculum composite scores of student achievement. The other two predictors were roof leaks, $\underline{R}^2 = .59$ and duration that graffiti remained on the walls, $\underline{R}^2 = .67$. These two variables together accounted for an additional 22% of the overall Science curriculum composite scores of student achievement.

Table 46

Step-Wise Multiple Regression Analysis for Best Predictors of Building Conditions Explained Student Achievement in All Subjects in the Sciences Major from the Overall Condition of Boys' Schools

	Boys' Schools (N=28)							
Achievement	Step	Variable Entered	*R*	R^2	*Adjusted R square*	*R Square Change*	*F*	*P*
Islamic Education	1	Graffiti	.67	.45	.43	.45	21.39	.000
Arabic Language	1	Graffiti	.67	.45	.43	.45	21.54	.000
	2	Roof Leaks	.76	.57	.54	.12	17.05	.000
English Language	1	Graffiti Removal	.68	.47	.453	.47	23.36	.000
	2	Roof Leaks	.77	.59	.56	.12	18.67	.000
Mathematics	1	Graffiti	.70	.49	.47	.49	24.98	.000
	2	Roof Leaks	.79	.63	.60	.14	21.79	.000
	3	Graffiti Removal	.83	.69	.66	.06	18.60	.000
Physics	1	Roof Leaks	.66	.43	.41	.43	20.23	.000
	2	Graffiti Removal	.76	.58	.54	.14	17.29	.000
Chemistry	1	Roof Leaks	.71	.50	.48	.50	26.38	.000
	2	Graffiti Removal	.81	.65	.62	.15	23.78	.000
Biology	1	Roof Leaks	.64	.41	.39	.41	18.33	.000
Sciences Curriculum Composite Score	1	Graffiti	.67	.45	.43	.45	21.63	.000
	2	Roof Leaks	.77	.59	.56	.14	18.4	.000
	3	Graffiti Removal	.82	.67	.63	.07	6.60	.000

The second analysis looked at the conditions of the boys' schools as predictors of student achievement in all subjects in the Arts major. Two main conditions were found to be significant predictors (number of areas containing graffiti and exterior noise) in explaining student achievement in the boys' schools. The variable related to the number of areas containing graffiti accounted also for 45% of the variance of the overall curriculum Arts composite scores of student achievement, while exterior noise accounted for an additional 14.3% of the overall Arts curriculum composite scores of student achievement (see Table 47).

The third analysis examined the condition of girls' schools as predictors of student achievement in all subjects in the Sciences major. None of the conditions was found to be significant in explaining student achievement in girls' schools (see Table 48).

The fourth analysis examined the conditions of girls' schools as predictors accounted for student achievement in all subjects in the Arts major. None of the conditions was found to be significant in explaining student achievement in girls' schools (see Table 49).

The fifth analysis examined the conditions of all schools as predictors accounted for student achievement in all subjects in the Sciences major. Two main conditions were found to be significant predictors (number of areas containing graffiti and roof leaks) in explaining student achievement in boys' schools (see Table 50). The variable related to number of areas containing graffiti accounted for 25% of the variance of the overall Sciences curriculum composite scores of student achievement. The variable of roof leaks accounted for an additional 5.4 % of the overall Science curriculum composite scores of student achievement.

Table 47

Step-Wise Multiple Regression Analysis for Best Predictors of Building Conditions Explained Student Achievement in All Subjects in Arts Major from the Overall Condition of Boys' Schools

	Boys' Schools (N=28)							
Achievement	Step	Variable Entered	*R*	R^2	*Adjusted R square*	*R Square Change*	*F*	*p*
Islamic Education	N/A							
Arabic Language	1	Graffiti	.50	.25	.23	.25	9.05	.006
	2	Exterior Noise	.69	.47	.43	.21	11.37	.000
English Language	1	Exterior Noise	.52	.27	.24	.27	9.75	.004
	2	Graffiti	.66	.44	.40	.17	10.15	.001
French Language	1	Roof Leaks	.49	.24	.21	.24	8.45	.007
History	1	Graffiti	.40	.16	.13	.16	5.03	.034
	2	Exterior Noise	.54	.29	.24	.13	5.28	.012
Geography	N/A							
Philosophy	1	Ground	.57	.32	.30	.32	12.63	.000
		Graffiti	.69	.48	.44	.15	11.66	.000
	2							
Psychology	1	Roof Leaks	.38	.15	.11	.15	4.57	.042
Arts Curriculum Composite Score	1	Graffiti	.67	.45	.43	.45	21.63	.000
	2	Exterior Noise	.77	.59	.56	.14	18.49	.000

Table 48

Step-Wise Multiple Regression Analysis for Best Predictors of Building Conditions Explained Student Achievement in All Subjects in Sciences Major from the Overall Condition of Girls' Schools

	Girls' Schools (N=28)							
Achievement	Step	Variable Entered	*R*	R^2	*Adjusted R square*	*R Square Change*	*F*	*p*
Islamic Education	N/A							
Arabic Language	N/A							
English Language	N/A							
Mathematics	N/A							
Physics	N/A							
Chemistry	N/A							
Biology	N/A							
Sciences Curriculum Composite Score	N/A							

Table 49

Step-Wise Multiple Regression Analysis for Best Predictors of Building Conditions Explained Student Achievement in All Subjects in Arts Major from the Overall Condition of Girls' Schools

	Girls' Schools (N=28)							
Achievement	Step	Variable Entered	*R*	R^2	*Adjusted R square*	*R Square Change*	*F*	*p*
Islamic Education	N/A							
Arabic Language	N/A							
English Language	N/A							
French Language	N/A							
History	N/A							
Geography	N/A							
Philosophy	N/A							
Psychology	N/A							
Arts Curriculum Composite Score	N/A							

Table 50

Step-Wise Multiple Regression Analysis for Best Predictors of Building Conditions Explained Student Achievement in All Subjects in Sciences Major from the Overall Condition of All Schools

	All Schools (N=56)							
Achievement	Step	Variable Entered	*R*	R^2	*Adjusted R square*	*R Square Change*	*F*	*p*
Islamic Education	1	Graffiti	.41	.16	.15	.16	10.88	.002
Arabic Language	1	Graffiti	.51	.27	.25	.27	19.93	.000
English Language	1	Graffiti	.50	.25	.24	.25	18.51	.000
	2	Graffiti	.56	.31	.28	.05	12.08	.000
	3	Removal Ground	.60	.36	.33	.05	10.03	.000
Mathematics	1	Graffiti	.50	.25	.23	.25	18.15	.000
	2	Roof Leaks	.56	.33	.29	.07	12.53	.000
Physics	1	Graffiti	.47	.22	.20	.22	15.52	.000
	2	Roof Leaks	.55	.30	.27	.07	11.47	.000
Chemistry	1	Roof Leaks	.46	.21	.20	.21	14.71	.000
	2	Graffiti	.53	.28	.26	.07	10.73	.000
Biology	**1**	Graffiti	.46	.22	.20	.22	15.23	.000
	2	Roof Leaks	.53	.28	.25	.06	10.42	.000
Science s Curriculum Composite Score	1	Graffiti	.50	.25	.23	.25	18.11	.000
	2	Roof Leaks	.56	.31	.29	.06	12.31	.000

The last analysis examined the conditions of all schools as predictors accounted for student achievement in all subjects in the Arts major. Only the variable regarding number of areas that contained graffiti was found to be a significant predictor in explaining student achievement in all schools (see Table 51). This variable accounted for 15.4% of the variance of the overall Arts curriculum composite scores of student achievement.

Table 51

Step-Wise Multiple Regression Analysis for Best Predictors of Building Conditions Explained Student Achievement in All Subjects in Arts Major from the Overall Condition of All Schools

	All Schools (N=56)							
Achievement	Step	Variable Entered	*R*	R^2	*Adjusted R square*	*R Square Change*	*F*	*p*
Islamic Education	1	Graffiti	.27	.07	.05	.07	4.47	.039
Arabic Language	1	Graffiti	.40	.16	.14	.15	10.36	.002
	2	Exterior Noise	.48	.23	.20	.06	7.91	.001
English Language	1	Graffiti	.36	.13	.11	.13	8.10	.006
French Language	1	Roof Leaks	.34	.11	.09	.11	7.07	.010
History	1	Graffiti	.40	.16	.14	.16	10.28	.002
Geography	1	Graffiti	.37	.14	.12	.14	8.79	.004
Philosophy	**1**	Graffiti	.39	.15	.13	.15	9.90	.003
Psychology	N/A							
Arts Curriculum Composite Score	1	Graffiti	.392	.154	.138	.15	9.80	.003

Summary

The results of the statistical analyses including descriptive statistics and inferential statistics were included in this chapter. The descriptive statistics summarized the responses of the schools principals to the revised CAPE instrument used in this study, while, inferential statistics included the results of Pearson's product moment correlation analysis, two-way factorial ANOVA, t-test as a follow-up tests of the main effects on student achievement, multiple regression, and step-wise multiple regression.

The correlation between the building condition of boys' schools and their achievement in the Sciences major indicated a positive relationship between the rating scores of overall, structural, and cosmetic building conditions and student achievement in all Science major subjects. Moreover, the results indicated that there was a relationship between the rating scores of only overall and structural building conditions and student achievement in most subjects in the Arts major. There was no relationship, however, between the rating scores of overall, structural, and cosmetic conditions and student achievement in all subjects in both the Sciences and Arts majors among all girls' schools.

Six analyses of two-way factorial ANOVA were performed and followed by the t-test analysis to test the main effect of overall, structural, and cosmetic building conditions on student achievement. The first analysis indicated that there was a significant main effect for the overall building condition on the Sciences curriculum composite score. The t-test as a follow-up test of the simple main effect of the overall condition on student achievement indicated that there were significant differences in all subjects in the Sciences major among only boys' schools. The second analysis indicated that there was no significant main effect for overall building condition on all subjects in the Arts major. The t-test used as a follow-up test, indicated that there were no

significant differences in all the Arts major subjects. The third analysis indicated that the structural building condition had a statistically significant main effect on the Sciences curriculum composite score. The t-test used as a follow-up test of the simple main effect of structural condition on student achievement, indicated that the top quartile of boys' schools scored significantly higher than the bottom quartile. The fourth analysis indicated that the structural building condition had no significant main effect on the Arts curriculum composite score. The t-test indicated that there were no significant differences in all subjects in the Arts major within the boys'and girls' schools. The fifth analysis indicated that the cosmetic building conditions had a significant main effect on the Sciences curriculum composite score. The t-test indicated that there were significant differences in all subjects in the Sciences major, except chemistry, among the boys' schools. The last two-way factorial ANOVA indicated that the cosmetic building condition had no significant effect in all subjects in the Arts major. The t-test indicated that there were no significant differences in all subjects in the Art major within the boys' and girls' schools.

The multiple regression results suggested that the overall building condition partially explained student achievement. There were at least two conditions that were found as significant predictors that explained student achievement in all subjects in the Sciences major, and there was at least one condition found as a significant predictor that explained student achievement in all subjects in the Arts major. Based on these results, presented in Tables 46 through 51, the variable related to number of areas containing graffiti was the most significant predictor explained student achievement in both the Sciences and Arts majors among all the boys' and girls' schools.

CHAPTER 5 CONCLUSION, DISSCUSSION, IMPLICATIONS FOR PRACTICE, AND RECOMMENDATIONS FOR FUTURE STUDIES

Chapter 5 includes, a discussion of principals' responses and the usage of CAPE instrument, an appropriate conclusion, a discussion of the results found in this study, and implications for educational practices and research as well as recommendations for future research.

Discussion of Principals' Responses

A careful analysis of the principals' responses to instrument questions has provided a clear picture of school buildings in Kuwait. The responses opened some wounds that were hidden inside of principals' hearts because they were asked to express their feelings and concerns regarding the existing condition of their schools. In particular, their concerns reflected the importance of school maintenance, the school site, and the school budget. For example, the problem of roof leaks was found in most of the older school buildings and even some new buildings. Over half of all principals of the older schools reported that there were roof leaks due to water damage. The structural defects that occur in newer precast buildings, as were mentioned by some principals, are less likely to cause the problem of water leaking. The age of the school building could be part of the problem, but regular maintenance could minimize water leaks in old school buildings. As this study found, schools were built mostly in the 1970s and 1980s. These schools, in general, are considered old enough to need regular maintenance or minor renovation to improve the existing conditions in order to meet the needs of the educational program. Without any regular maintenance, water leakage could lead to a

structural damage of the classroom ceilings as well as damage to the floor. Principals believe that maintenance is one of the top priorities that administrators in the school district and the Kuwaiti Ministry of Education need to consider, discuss, and have on their agenda. Deferred maintenance might result in costly renovations or the need to build new schools. Fast and effective decisions regarding regular and urgent maintenance would help protect the building from further deterioration.

All school buildings have similar physical features because of the traditional design required by the Kuwaiti Ministry of Education. For example, all classrooms have windows, tile flooring, concrete ceilings, and hot fluorescent lighting. Although none of these features was reported as a significant predictor of student achievement in this study, they were found to be related to student achievement. For example, none of the schools have classrooms that are carpeted and fitted with plaster or acoustical tiles to reduce the level of noise produced inside the classroom due to the classroom size or from outside due to the location of the school near a noise-producing environment. About 30% of all principals reported that their schools were located near busy roads and next to a number of other schools that increased the noise, which had a negative effect on students' attention.

The location of a school is important and needs to be chosen carefully. Because most schools are located next to and near to a neighborhood or other schools, most principals reported that the school grounds are not landscaped, do not have sidewalks, and are unattractive to the surrounding community. The outside grounds are used as a parking lot for school staff and visitors.

Another issue brought to discussion was school budgets. A school's budget is assigned by the Kuwaiti Ministry of Education, and it is not enough to use for building and improvement. Consequently, water damage to floors or ceilings due to leaking roofs goes unrepaired, classrooms remain uncarpeted, interior and exterior walls are not painted regularly, and science laboratories are not updated. In fact, most principals reported that science laboratory equipment was updated between five to ten years ago or sometimes over ten years ago. In order to buy new equipment or to install new utilities, a school needed to request to more funds for its budget. When graffiti containing inappropriate words or images, another building condition problem, needs to be removed, the schools would use money generated from the school cafeteria or ask for outside support and donations.

The inadequate school budget has led some school principals to complain about the absence or shortage of custodial staff in their schools due to the type of contract between the school and the cleaning company. The budget has also prevented the school from having sidewalks acceptable to the surrounding community.

Discussion of the Usage of CAPE Instrument

The CAPE instrument includes items related to the overall condition of the building. In addition, these items are separated and categorized into structural and cosmetic building conditions for further analysis. The beauty of the CAPE instrument is that all its items are directly related to student achievement except the item regarding the school ground that might have an indirect impact on student achievement. However, the CAPE has limitations and cannot be considered as a comprehensive assessment tool of school building conditions. First, although the CAPE helps the evaluator to assess the school building conditions, the assessment of the

school conditions is reported only in term of groups of schools instead of providing a demarcation or a precise division between adequate and inadequate building conditions. The inability to come up with a discrete finite score for each building limits the analysis that can be done in examining the relationship between building condition and student achievement. In addition, the CAPE was not designed to quantify each item, which in turn does not allow researchers to conduct more sophisticated analysis of the effect each condition might have upon a possible relationship.

Moreover, there are some items, such as air-conditioning and heating are not relevant or pertain to school building in some places, such as Kuwait, Saudi Arabia, Qatar, Bahrain, United Arab of Emirates, and Oman although these are important factors affect student achievement. These items might be superfluous to help the researcher to come up with accurate discrete scores regarding the building conditions in these countries.

Conclusion

The results of this study indicated that there was a statistically significant relationship between building conditions and student achievement. However, the main effect of building conditions on student achievement varies according to gender and academic major. When all buildings were analyzed, a significant positive relationship was found between the overall, structural, and cosmetic building conditions and student achievement in the Sciences major. For the Arts major, however, when all buildings were analyzed, a significant positive relationship was found only between the overall and structural building conditions and student achievement and not with the cosmetic building condition.

When the condition of the boys' schools was used to compare student achievement, a significant relationship in the Sciences major. Building conditions have a lesser impact on

academic achievement in the boys' schools in the Arts major. However, in the girls' schools, building conditions do not affect academic achievement in the Sciences and Arts major. This finding suggests that student achievement can be explained by gender as well. Graffiti and roof leaks are the main predictors of physical aspects of a building's condition account for student achievement.

Discussion of Analysis Results

The analysis of this study shows different results regarding the relationship between the building condition and student achievement. It was found that there is a relationship between the rating scores of boys' schools' buildings on overall, structural, and cosmetic conditions and student achievement in the Sciences major. There is also a relationship between the rating scores of boys' schools' buildings on only overall and structural conditions and student achievement in the Arts major. The analysis shows that there is no relationship at all between the rating scores of girls' schools' buildings on overall, structural and cosmetic building conditions and student achievement in all subjects in the Sciences and Arts majors. However, a general comparison of the total group of schools indicates that there is a substantial relationship between the rating scores of buildings on overall, structural, and cosmetic conditions and student achievement in all subjects in the Sciences major, and there was a weak relationship between the rating scores of building on overall and structural conditions and student achievement in all subjects in the Arts major. No relationship was found between rating scores of building on cosmetic condition and student achievement in all subjects in the Arts major.

The two-way factorial ANOVA helped to examine the main effect of building condition and gender on student achievement. This analysis also has helped to see if there was an interaction between these two variables on student achievement. The results of this analysis, as

well as the t-test analysis, helped to understand why there was or was no relationship between building condition and student achievement. The results show that there is a significant main effect for the overall, structural, and cosmetic building conditions and gender on achievement of students in only the Sciences major. There was a significant interaction between the overall and structural building conditions and gender in only the Science major. The t-test indicated that there were significant differences in all Sciences subjects among only boys' schools.

Many factors can affect student achievement. The condition of the school is one that explains and accounts for student achievement. Other factors, such as a national curriculum, teaching qualifications, and the socioeconomic (SES) status are important factors which might affect student achievement. It was very difficult for the researcher to control the SES of all students, because there was no measure that could determine the SES of students, not even by taking into consideration the number of Kuwaiti and non-Kuwaiti who attend public high schools. Because Kuwait is a wealthy country, the minimum wage is relatively high for parents of Kuwaiti and non-Kuwaiti students. This policy causes the Kuwait society to have a great deal of homogeneity. This same homogeneity is displayed in the student population of the schools. The type of homogeneity displayed in Kuwait would not be in evidence in any non-Arab countries in the world. To enroll any non-Kuwaiti student, his or her father must work for the Kuwaiti Army or Police, or either parent must be a trained professional such as a teacher or a doctor. Therefore, the SES of students was not considered a useful factor for this study. As mentioned before, the lack of appropriate SES indices that could be introduced into the formula resulted in a heavier weighting given to the remaining variables than would ordinarily have been given if a SES index were available. Since the curriculum is the same over the whole country, it

is not a factor nor is teacher qualifications since all teachers hold at least a bachelor degree in teaching as well.

Most students who opted to be in the Sciences major have to pay more attention and focus on most Sciences subjects, such as mathematics, physics, chemistry, and biology, while, students in the Arts major depend more on memorizing materials. Interest in an area usually plays a role in a student's choice of major. Therefore, academic achievement of a student in the Sciences major is more likely to be related to building condition. In addition, three other reasons could explain why building condition significantly affects student achievement in only boys' schools. First, since the number of female students is higher than male students and Kuwait University can accept only a specific and limited number of female students, there is an intense effort among female students in all majors to be accepted in Kuwait University. Kuwait University also raises the standard of admission, such as the composite score in the Sciences and Arts Curricula for female students in order to maintain a balance between boys and girls. Since the concern of girls in this situation is to accumulate a high score, the condition of building in this case might not have affected girls' achievement in the Sciences and Arts majors. Secondly, because Kuwaiti culture is derived from Islam, most girls spend most of their times staying home. This helps them to study hard and accumulate higher scores than boys. Thirdly, because of restriction imposed on female teachers in terms of evaluation and promotion due to the high volume of female teachers, female teachers work hard and try to use an effective instructional teaching style.

The result of multiple regression shows that building condition explains student achievement only in the Sciences major and only among boys' schools. This is because of the reasons mentioned above. The step-wise multiple regression shows that the most important

conditions that account for student achievement are graffiti and roof leaks. These two variables were related to school budget and school maintenance. These variables send a clear message to the Kuwaiti Ministry of Education to rethink its polices for regular maintenance and school budget. The age of the science laboratory was not found to be one of the predictors that explain student achievement. This perhaps due to the fact that the academic achievement is based upon learning books rather than laboratory work.

The results of this study support what previous studies (Cash, 1993; Earthman, Cash, and Van Berkum, 1996; Hines, 1996) have found regarding the relationship between building condition and student achievement. The studies (Bowers & Burkett, 1987; Garret, 1980; Phillips, 1997; Plumley, 1978) found significant relationships. The present study also supports the findings of these studies. The results of these studies have shown that a relationship exists between these two variables. The significance of the relationship found in these studies was not examined, as it has been in this study, to probe the significance of findings in order to determine the degree to which building condition can explain student achievement. This study's examination of the significance of effect of building conditions on student achievement has helped to provide evidence to speak about the role of building conditions regardless of the degree of influence on student achievement, although other variables, such as teacher satisfaction and competition for a place at the university, also play a role in student achievement.

Structural and cosmetic conditions appear to affect student achievement. Graffiti and roof conditions, for example, were found to be significant predictors of student achievement. These two variables may affect the students' attitudes that, in turn, affect their academic achievement. Most of structural conditions, however, were not examined in this study, because, as mentioned earlier, most of them are alike among all Kuwaiti public high schools. Interestingly enough, the

age of school building does not contribute as much as cosmetic conditions do to for student achievement. However, routine and regular maintenance of most facilities becomes more important as a facility ages than the age of the school building itself. Routine maintenance of buildings keeps older schools up as adequate learning environments. Furthermore, student achievement in most academic subjects was significantly correlated with only boys' schools with updated science laboratories. The location of schools next to a source of noise also is associated with student achievement. A quit location was significantly correlated with higher student achievement.

It is possible to question the validity and the limitations of the findings of this study because since it is exploratory and uses a purposefully specific "convenience sample" of schools, the findings cannot be generalized to other samples or populations. The findings of this study, however, support the relationship between building condition and student achievement that is addressed in the theoretical model for this study (see Figure 4, p. 8). The relationships between the other variables that are presented in that theoretical model were not tested in this study. other researchers should investigate other relationships in this model.

However, building conditions, in general, can hamper learning. Better building conditions appear to be an important precondition for student learning. The physical conditions have direct positive and negative effects on the general learning environment. Therefore, school administrators should consider the upkeep of school facilities as their greatest priority and work to maintain high student achievement with the regular maintenance. Deferred maintenance, funding priorities, and administrative decisions play an important role in the physical quality of a building which, in turn, affects student achievement.

Implications for Practice

The findings of this study have provided additional data to the top administration at the Ministry of Education in Kuwait to support the argument for paying more attention to the quality of the school buildings in Kuwait, because building conditions are a factor that can influence student achievement. Based on the findings of this study, the Kuwaiti Ministry of Education needs to form policy related to a program of improved school facilities for all new schools. In order to improve outcomes, other ways to improve environmental qualities in schools that will make a difference in those particular schools are needed. Ironically, administrators would hire experts in order to develop a comprehensive building assessment and build a better understanding of how well the facility meets the needs of the educational program and what particular quality conditions affect student achievement.

Recommendations for Future Research

This study of the relationship between building conditions and student academic achievement is the first study that was conducted outside the United State of America. The findings of this study should be substantiated by a replication in other non-U.S. countries. More research is needed to extend the breath of findings regarding the relationship between building conditions and student academic achievement. More research also might help to demonstrate a strong relationship that, in turn, allows findings to be generalized.

Because of the limitations of the CAPE instrument to assess some of the structural conditions that were alike among all Kuwaiti public high schools, such as the thermal, acoustical, and visual environments, extensive research is needed to examine the influence of the these factors on student achievement. This can be done by examining whether minimum standards for acoustics, lighting, heating and air conditioning as requirements for a quality school building are

met in Kuwait. If this study is replicated, the researcher might want to add more responses to each question used in the CAPE instrument to better examine the building condition.

Because it was found in this study that there is a positive significant relationship between building condition and student achievement in only boys' schools and not in girls' schools, a qualitative study might be followed to examine student attitudes toward building condition to explain this difference. The researcher might interview students and have them state and list all school building conditions items that might limit or encourage them to learn. These data might shed some light on how and why these conditions either affected or did not affect their attitudes.

This study did not specifically address the relationship between school building conditions and teacher effectiveness. Nevertheless, there is sufficient research to indicate a positive relationship. All of these studies were conducted in U.S schools. Little evidence exists regarding a possible relationship in non-U.S. schools. The present study does indicate that this area needs to be explored in Kuwaiti schools. Kuwaiti teachers' attitudes toward the conditions of the public high school buildings and subsequent influence on student attitudes are fodder for another important study that should be conducted. Such study would examine whether or not the working conditions have direct positive and negative effects on teacher morale, feelings of effectiveness in the classroom, and the general learning environment.

As part of this study, teacher satisfaction or dissatisfaction and the building should be explored because the conditions of the school buildings might cause the teacher dissatisfaction if a teacher feels that he or she cannot utilize the classroom for a better teaching style because of a small classroom space filled with more students than expected. In addition, a teacher might feel dissatisfied when the classroom or the school building is in poor or even sub-standard condition. For example, in Kuwait, there are some schools that do not do regular maintenance to keep the

school building in good conditions or provide good air-conditioning or heating services. Such neglect might cause teachers to think that their needs are ignored. It is important to know how perceived teachers' attitudes toward the condition of their school buildings affect their moral, their performance in the classroom and their self-esteem.

Attitudes of student teachers from Kuwait University toward the conditions of the school buildings should be examined as well. Before they are assigned to a particular school, student teachers might have some questions about these schools and especially what the school might look like. In other words, what do student teachers expect the school buildings look like and " are these schools their dream schools?" During the school session, these student teachers might positively or negatively perceive the conditions of the school buildings to which they are assigned to practice the teaching before their graduation. Most student teachers tend to work in other fields rather than the teaching profession. This study might help the top administration at the Ministry of Education in the State of Kuwait understand why students leave the teaching profession and find appropriate solutions to help with retention of these teachers.

For better understanding of school planning in Kuwait, there is a need for a more comprehensive case study that helps to trace the planning process from the stage of designing schools to the stage of constructing the schools in the Ministry of Education at the State of Kuwait. This study might present the processes considered to build any public school building in Kuwait. The processes beginning from planning to construction stage might be investigated in another country, such as the United States of America, and compared with the processes in Kuwait. This study might identify factors that play key roles in the process of making decisions, handling funding issues, and utilizing the planning period advantageously to build a quality school.

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APPENDIX A

The Revised Commonwealth Assessment of Physical Environment (CAPE)

Instruction: Please indicate the status of your facility in each area by circling the most appropriate description for each of the following questions. You may provide additional information in the space provided after each question.

1. What is the age of the facility?

[A FACILITY 'S AGE IS YOUR BEST ESTIMATE OF THE PERIOD DURING WHICH MOST OF THE SPACE USED BY STUDENTS WAS BUILT. IF THE SPACE WAS FULLY UPDATED TO THE BUILDING STANDARD OF LATER TIME PREIOD, CONSDER THE SCHOOL IN THE LATER TIME PERIOD.]

   a. 30-39 years old
   b. 20-29 years old
   c. 10-19 years old
   d. Under 10 years old

   Comments: _____

2. Are windows in each instructional space (classroom)?

   a. Windows are in fewer than 1/4th of the instructional spaces
   b. Windows are in at least 1/4th of the instructional spaces
   c. Windows are in at least 3/4th of the instructional spaces

   Comments: _____

3. What kind of flooring is found in the majority of the instructional spaces?

   a. Wood floor
   b. Tile or terrazzo
   c. Carpet

   Comments: _____

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

    Comments: _____

5. What quality of air conditioning is found in the majority the instructional spaces?
    a. No air conditioning in the facility
    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

    Comments: _____

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

    Comments: _____

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

    Comments: _____

8. Are there visible indications of roof leaks?
    a. Ceiling is deteriorating due to water damage, and/or water falls in some areas of 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

    Comments: _____

9. Which of the following facilities are adjacent to, or part of, the schools complex? Please circle all that apply.
    a. Soccer field
    b. Basketball field
    c. Volleyball field
    d. Handball field
    e. Swimming pool

    Comments: _____

10. How often are the instructional area floors swept (if wood, tile, or terrazzo) or vacuum (if carpeted)?
    a. Monthly
    b. Weekly
    c. Daily or more frequently

    Comments: _____

11. How often are the instructional area floors mopped (if wood, tile, or terrazzo) or cleaned (if carpeted)?
    a. Annually
    b. Monthly
    c. Weekly or daily

    Comments: _____

12. Is graffiti commonly found on premises? Circle yes or no for each listed area.

a. Bathrooms	Yes	No
b. Hallways	Yes	No
c. Classroom Walls/Doors	Yes	No
d. Other Interior Surfaces	Yes	No
(Please specify)_____		
e. Exterior Walls	Yes	No
f. Exterior Walkways	Yes	No
(Please specify)_____		

    Comments: _____

13. How often 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 #12

    Comments: _____

14. What type of material is used for interior ceiling?
    a. Concrete tile “Wall tile"
    b. Plaster or acoustical tiles in at least three/fourths of the instructional spaces
    c. Acoustical tiles throughout the instructional spaces

    Comments: _____

15. Please indicate which utilities or equipment are available and in useable condition in the science labs. (Please circle all that apply)
    a. Gas
    b. Water
    c. Sink
    d. Electricity

    Comments: _____

16. How long ago was science equipment updated to current standards?
    a. Over 10 years ago
    b. Between 5 and 10 years ago
    c. Less than 5 years ago or the building is less than 5 years

    Comments: _____

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

    Comments: _____

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

    Comments: _____

19. What is the condition of the school grounds?
    a. There is no landscaping, and sidewalks are either not present or damaged (it is unattractive to the community)
    b. There is landscaping, and sidewalks are present and in good repair (it is accepted to the community)
    c. The landscaping, and other outside facilities are attractive and well-maintained (it is a center of pride for the community)

    Comments: _____

20. What color are the walls in the instructional areas?
    a. Dark colors
    b. White
    c. Pastel Colors

    Comments: _____

21. Is the facility located near a busy, major highway, a frequency used rail line, an area where aircraft frequently pass overhead, or any other loud noise producing environment?
    a. Yes, and no measure have been taken to reduce the level of noise within the facility
    b. Yes, but measure have been taken to reduce the level of noise within the facility
    c. No

    Comments: _____

Thank You

APPENDIX B

The Arabic Translation of the Revised Commonwealth Assessment of Physical Environment (CAPE)

نموذج تقييم المباني المدرسية
من الناحية التركيبية البنائية
والناحية الجمالية

إن هذا الإستبيان الذي بين يديكم خاص بتقييم المباني المدرسية من الناحية التركيبية البنائية والناحية الجمالية. إن لتقييم المدرسة من الناحيتبن المذكورتين دلالة أو علاقة واضحة مع التحصيل الطلابي في بعض الدول كالولايات المتحدة الأمريكية. لذا يستهدف من وراء تعبئة هذه الإستبانة إلى تقييم المباني المدرسية الحكومية للمرحلةالثانوية في دولة الكويت لمعرفة إن كانت هناك علاقة مابين حالة المبنى المدرسي من الناحية التركيبية البنائية و الجمالية مع التحصيل الطلابي لطلبة الصف الرابع الثانوي على وجه الخصوص.

تعليمات: الرجاء تحديد الحالة المناسبة لكل فقرة وذلك بوضع دائرة حول الوصف الأمثل لكل من الأسئلة التالية:

السؤال الأول: ما هو العمر الزمني المدرسة ؟

(العمر الزمني للمدرسة يمكن أن يكون أفضل تقدير زمني لديكم للعام الدراسي التي بدأت فيها المدرسة استقبال الطلبة) .

أ - 30 الى 39 سنة

ب- 20 الى 29 سنة

د- 10 الى 19 سنة

ه- أقل من عشر سنوات

ملاحظة:.....

.....

السؤال الثاني: هل توجد نوافذ زجاجية في كل الفصول الدراسية؟

أ- 25% من الفصول الدراسية توجد بها نوافذ زجاجية

ب- أكثر من 25% من الفصول الدراسية توجد بها نوافذ زجاجية

ج- 75% فما فوق من الفصول الدراسية توجد بها نوافذ زجاجية

ملاحظة:.....

.....

السؤال الثالث: ماهي نوعية الأرضية المستخدمة في معظم الفصول الدراسية؟

أ- خشب

ب- بلاط (كاشي)

ج- سجاد

ملاحظة:.....

.....

السؤال الرابع: هل يمكن التحكم في التدفئة في الفصول الدراسية؟

أ - لا يمكن التحكم في التدفئة في جميع الفصول الدراسية

ب- يمكن التحكم في التدفئة في بعض الفصول الدراسية

ج- يمكن التحكم في التدفئة في جميع الفصول الدراسية

ملاحظة:.....

.....

السؤال الخامس: هل الفصول الدراسية مكيفة؟

أ - جميع الفصول الدراسية غير مكيفة

ب- بعض الفصول الدراسية مكيفة

ج- جميع الفصول الدراسية مكيفة

ملاحظة:.....

.....

السؤال السادس: متى كانت آخر عملية تم فيها صبغ الجدران الداخلية للفصول الدراسية؟

أ - أكثر من 15 سنة

ب- مابين 8 و 15 سنة

ج- أقل من 8 سنوات

ملاحظة:.....

.....

السؤال السابع: متى كانت آخرعملية تم فيها صبغ الجدران الخارجية أو الجدران الخارجية مع إطارات نوافذ الفصول الزجاجية من الخارج؟

أ - أكثر من 7 سنوات

ب- مابين 4 و 7 سنة

ج- أقل من 4 سنوات (او لاتحتاج الجدران الخارجية أو إطارات النوافذ أن تصبغ)

ملاحظة:.....

.....

السؤال الثامن: هل هناك أية تسربات واضحة للمياة ناتجة بسبب تصدعات واضحة في سقف الفصول الدراسية؟

أ – السقف متصدع بسبب تجمع مياة الأمطار وعدم وجود مصارف لهذه المياة

ب- هناك بقع صغيرة توجد على السقف بسبب وجود بعض التسربات الخفيفة والطفيفة

ج- لاتوجد أي تصدعات ملحوظة ولكن يمكن أن تكون هناك بقع قديمة لاتأثير لها

ملاحظة:.....

.....

السؤال التاسع: ما هي المرافق المتصلة أ و جزء من المبنى المدرسي؟

أ - ملعب كرة قدم

ب- ملعب كرة سلة

ج- ملعب كرة طائرة

د - ملعب كرة يد

ه- حمام سباحة

ملاحظة:.....

.....

السؤال العاشر: كم مرة يتم فيها تنظيف الفصول الدراسية(إذا كانت الأرضية من الخشب أو الكاشي) أو تكنس إذا كانت الفصول الدراسية مفروشة بالسجاد؟

أ - شهريا

ب- اسبوعيا

ج- يوميا أو معظم الأحيان

ملاحظة:.....

.....

السؤال الحادي عشر: كم مرة يتم فيها تشطيف الفصول الدراسية(إذا كانت الأرضية من الخشب أو الكاشي) أو تنظف إذا كانت الفصول الدراسية مفروشة بالسجاد؟

أ - سنويا

ب- شهريا

ج- اسبوعيا أو يوميا

ملاحظة:.....

.....

السؤال الثاني عشر: هل توجد كتابات في الأماكن التالية:

أ – جدران دوراة المياة	نعم	لا
ب- جدران الممرات	نعم	لا
ج- جدران أو أبواب الفصول الدراسية	نعم	لا
د- الجدران الخارجي للمدرسة	نعم	لا

ملاحظة:.....

.....

السؤال الثالث عشر: ما هي المدة الزمنية التي تبقى فيها الكتابات على الجدران قبل مسحها؟

أ - حتى وقت الصيانة في فترة الصيف أو في الموعد القادم المرتب له لصبغ المدرسة

ب- أكثر من اسبوع ولكن أقل من شهر

ج- أقل من اسبوع (أو لا عندما تكون الإجابة لا لجميع أجزاء السؤال الثاني عشر)

ملاحظة:.....

.....

السؤال الرابع عشر: ماهي المادة المستخدمة في السقف الداخلي للفصول الدراسية؟

أ - خشب

ب- طبقة صلبة عازلة للصوت تغطي 75% من مساحة السقف الكلية

ج- طبقة صلبة عازلة للصوت تغطي جميع مساحة السقف الكلية

ملاحظة:.....

.....

السؤال الخامس عشر: ما هي المواد أو المعدات أو الخدمات المتوفرة داخل المختبرات العلمية؟ (ممكن أن تكون الإجابة أكثر من إختيار واحد)

أ - غاز

ب- ماء

ج- مغاسل

د- كهرباء

ملاحظة:.....

.....

السؤال السادس عشر: متى كانت المرة الأخيرة التي تمت فيها تحديث المختبرات العلمية؟

أ – أكثر من 10 سنوات مضت

ب- مابين 5 إلى 10 سنوات

ج- أقل من 5 سنوات (العمر الزمني للمدرسة أقل من 5 سنوات)

ملاحظة:.....

.....

السؤال السابع عشر: ما هي نوعية الإضاءة المستخدمة في الفصول الدراسية؟

أ - شمعية (لمبات)

ب- فلورسنت (نيون أو نجفات)

ملاحظة:.....

.....

السؤال الثامن عشر: ما هي حالة الأثاث (الكراسي والطاولات) في الفصول الدراسية؟

أ - معظم الفصول الدراسية تحتوي أثاث في حالة رديئة وخطيرة لدرجة انها قد تحدث إصابات عند الطلبة

ب- تقريبا نصف (50%) عدد الفصول الدراسية تحوي أثاث في حالة معقولة مع بعض وجود دمار بسيط لبعض الطاولات والكراسي ولكن يمكن أن يوصف الأثاث في هذه الفصول الدراسية على أنه معقول

ج- جميع الفصول الدراسية أو على الأقل 75% من الفصول الدراسية تحوي أثاث بصورة ممتازة وتجذب إنتباة الطلبة

ملاحظة:.....

.....

السؤال التاسع عشر: ما هي حالة مساحة الأرض الخارجية التابعة للمدرسة؟

أ - المساحة ليست مخططة جيدا، ولم تستغل لعمل ممرات بها وإن وجدت هذه الممرات فهي مدمرة (أستطيع أن أقول بأن هذه المساحة غير مستفاد منها وغير جذابة أيضا لأهالي المنطقة السكنية التابعة لها المدرسة)

ب- المساحة مخططة وتوجد ممرات مشي بها، وهي نوعا ما مقبولة من أهالي المنطقة المنطقة السكنية التابعة لها المدرسة

ج- المساحة مخططة جيدا وجذابة جدا للأهالي المنطقة السكنية التابعة لها المدرسة

ملاحظة:.....

.....

.

السؤال العشرون: ماهي ألوان جدران الفصول الدراسية؟

أ - ألوان قاتمة

ب- أبيض

ج- ألوان فاتحة

ملاحظة:.....

.....

السؤال الواحد و العشرون: هل المدرسة قريبة من بعض المصادر المسبّبة للإزعاج مثل المطار أو بعض الشوارع الرئيسية أو خطوط الطرق السريعة؟

أ - نعم، ولا توجد بعض المحاولات لتخفيف حدة الإزعاج

ب- نعم، و توجد بعض المحاولات لتخفيف حدة الإزعاج

ج- لا توجد أية مصادر للإزعاج

ملاحظة:.....

.....

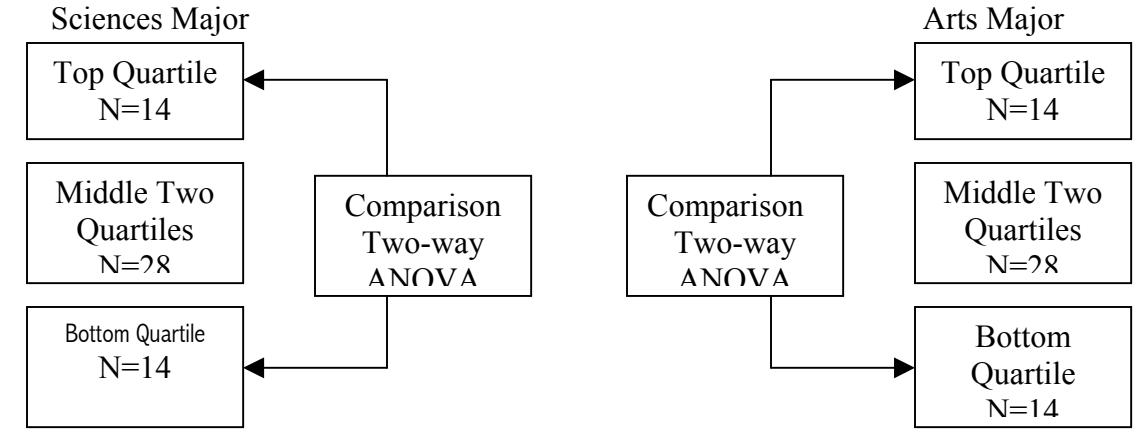
شاكرين لكم حسن تعاونكم

APPENDIX C

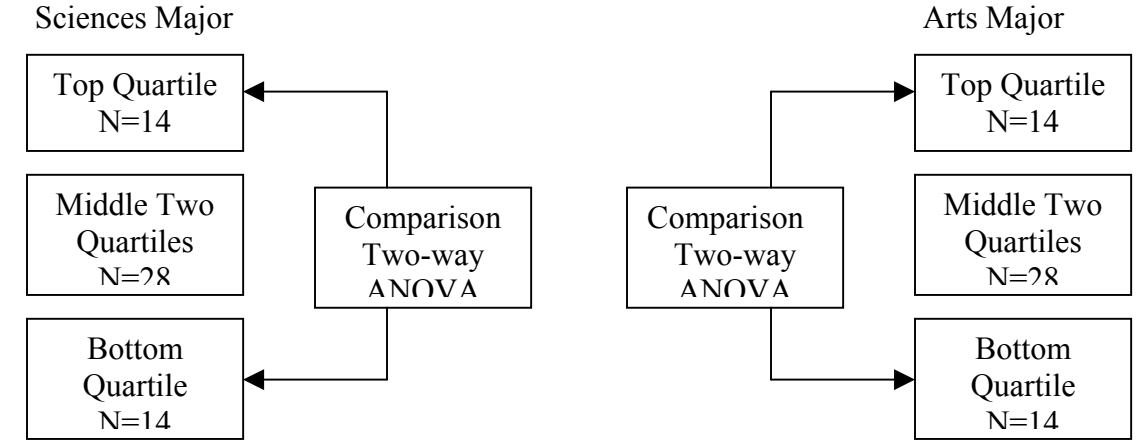
Comparisons between the Top and Bottom Quartile School Buildings Using Two-way ANOVA to Compare Student Achievement among the Total School Buildings and Using T-Test as A Follow-Up Test to Compare Student Achievement within the Boys' Schools and the Girls' Schools

Total Schools
N=56

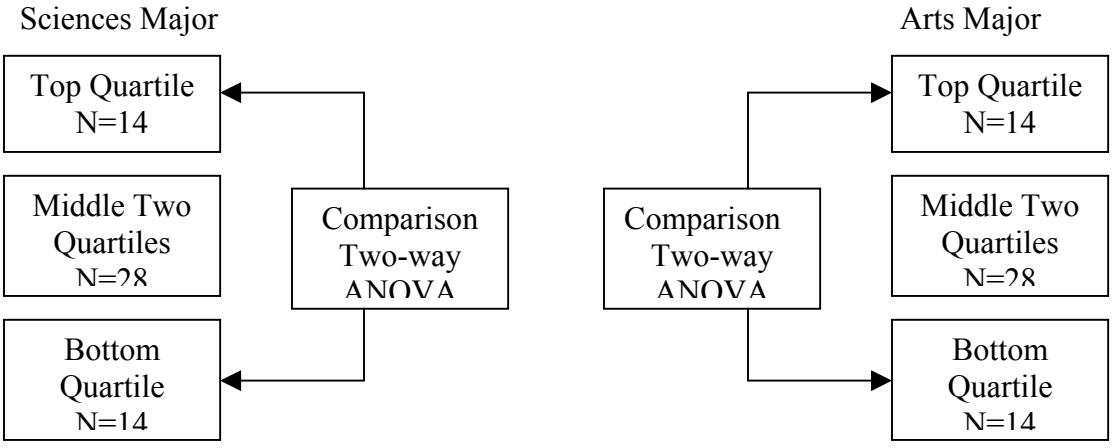
A. Overall Building Condition



B. Structural Building Condition

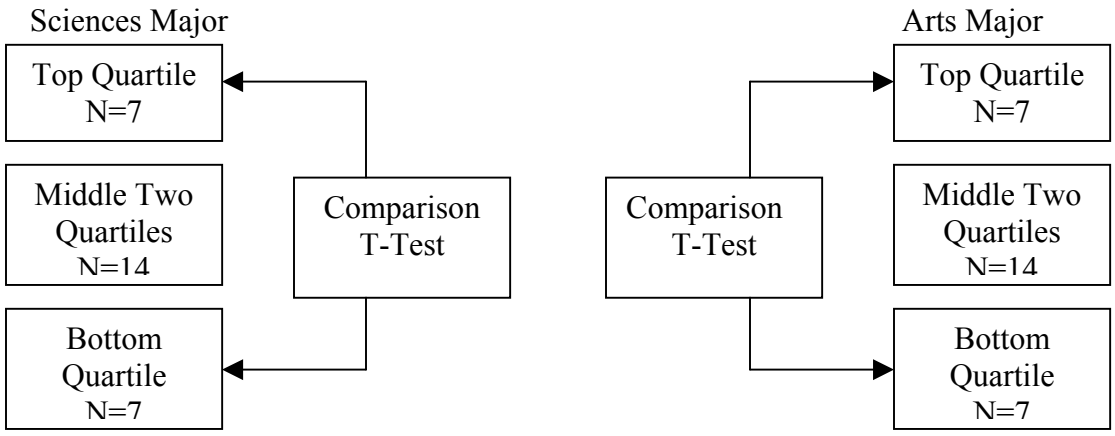


C. Cosmetic Building Condition

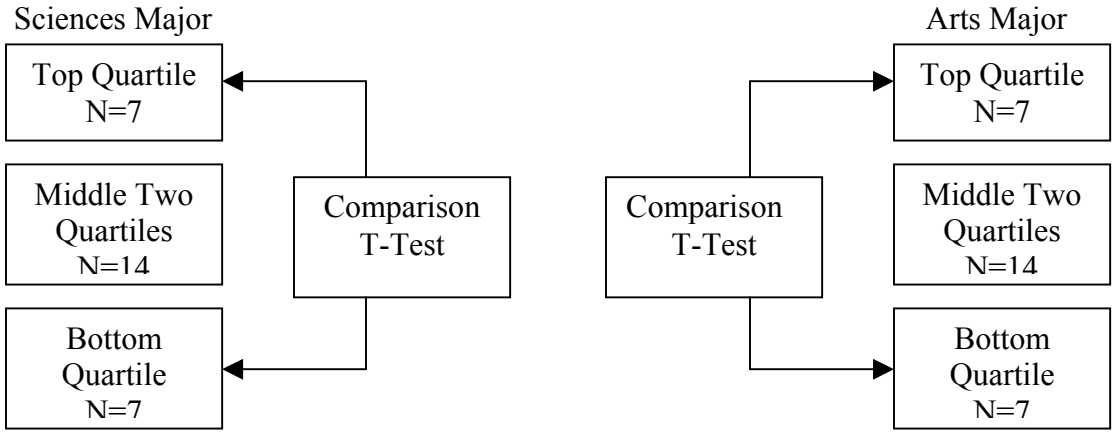


Boys' Schools
N=28

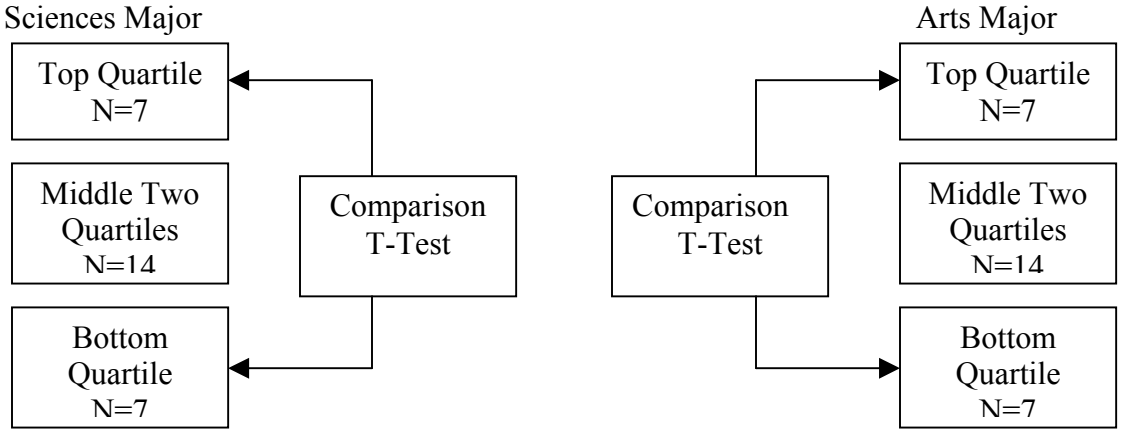
A. Overall Building Condition



B. Structural Building Condition

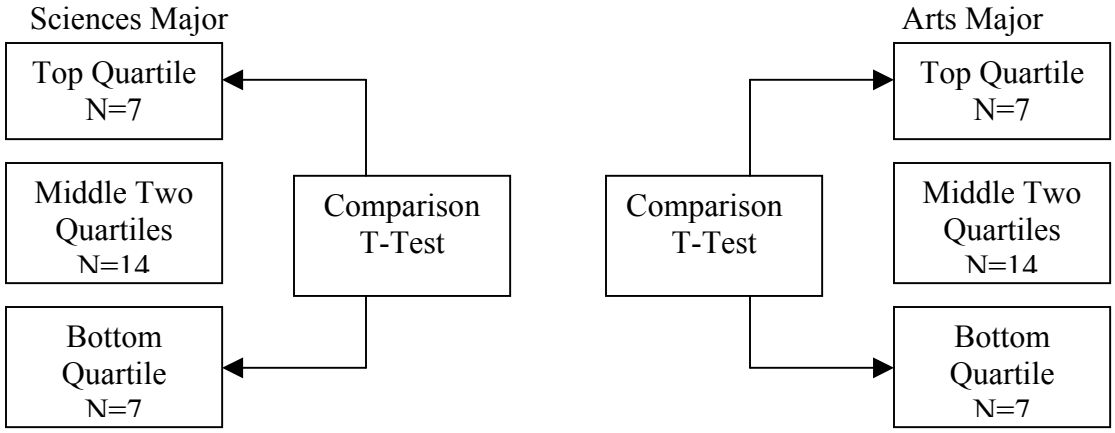


C. Cosmetic Building Condition

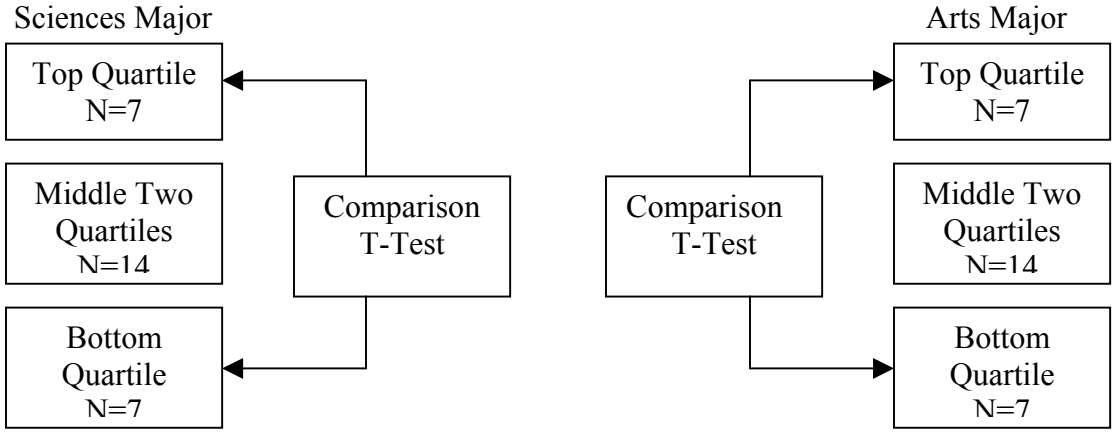


Girls' Schools
N=28

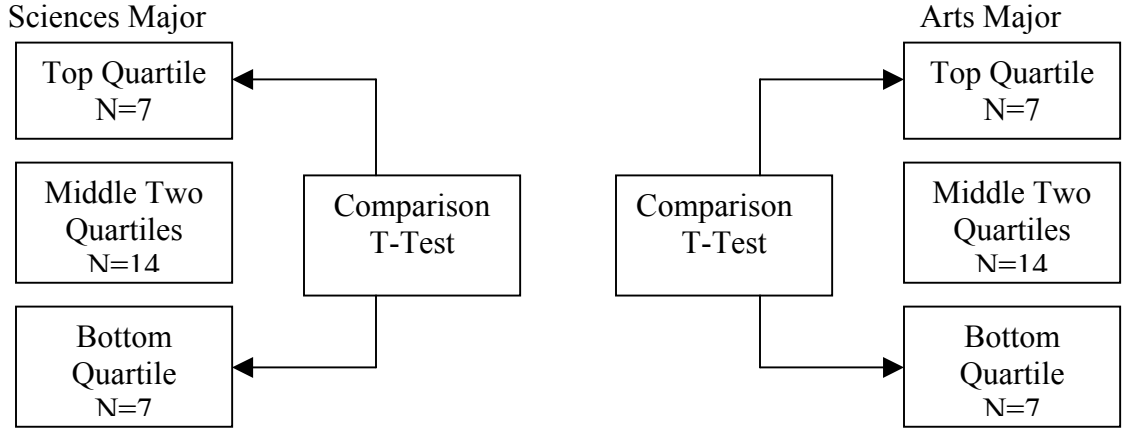
A. Overall Building Condition



B. Structural Building Condition



C. Cosmetic Building Condition



APPENDIX D

Correlations Between Building Conditions and Student Achievement in All Subjects

Correlations Between Building Conditions of Boys' Schools and Student Achievement in All Subjects in Science Major

	Building Conditions N=28												
Achievement	School Age	Roof leak	Lab Age	Wall Color	Noise	Interior Walls	Exterior Walls	Floor Swept	Floor Mopped	Graffiti	Graffiti Removal	Furniture	Ground
Islamic Education	-.120	.549*	.536*	.230	.358	.088	-.057	-.080	-.077	.672*	.510*	.168	.360
Arabic Language	-.111	.649*	.560*	.238	.425	.141	.103	.105	-.088	.673*	.576*	.369	.306
English Language	-.151	.594*	.594*	.290	.329	.182	.019	-.037	-.150	.645*	.688*	.259	.301
Mathematics	-.108	.688*	.629*	.297	.359	.168	.129	.048	-.074	.700*	.627*	.371	.309
Physics	-.006	.662*	.628*	.343	.343	.092	.042	.027	-.063	.629*	.606*	.327	.346
Chemistry	-.133	.710*	.650	.266	.365	.122	.075	-.035	-.102	.589*	.635*	.317	.257
Biology	-.133	.643*	.617*	.310	.353	.197	.138	.038	-.057	.667	.683	.374	.319
Sciences Curriculum composite	-.085	.671*	.631*	.299	.354	.141	.071	.024	-.073	.674*	.636*	.331	.330

* $p < .05$

Correlations Between Building Conditions of Boys' Schools and Student Achievement in All Subjects in Art Major

Achievement	Building Conditions N=28											
	School Age	Roof leak	Lab Age	Noise	Interior Walls	Exterior Walls	Floor Swept	Floor Mopped	Graffiti	Graffiti Removal	Furniture	Ground
Islamic Education	.337	.328	.023	.352	-.101	-.178	-.313	-.067	.224	-.137	.220	.304
Arabic Language	.189	.352	.299	.498*	-.055	-.031	-.143	-.183	.508*	.231	.307	.337
English Language	.077	.515*	.340	.522*	-.130	.109	-.177	.069	.450*	.361	.413*	.262
French Language	.305	.495*	.243	.479*	-.055	.071	-.339	-.079	.412	.248	.340	.371
History	.227	.363	.201	.392*	-.100	.079	-.133	-.064	.403*	.214	.329	.312
Geography	.213	.336	.027	.130	.015	-.065	-.267	-.082	.365	.104	.255	.166
Philosophy	.359	.378*	.139	.285	-.023	-.062	-.215	-.147	.569*	.259	.259	.572*
Psychology	.235	.387*	.039	.322	.036	-.054	-.084	.050	.212	.102	.155	.168
Arts Curriculum composite Score	.262	.492*	.294	.485*	-.088	.008	-.249	-.062	.496*	.256	.385*	.374

* $p < .05$

Correlations Between Building Conditions of Girls' Schools and Student Achievement in All Subjects in Science Major

Achievement	Building Conditions N=28												
	School Age	Roof leak	Lab Age	Wall Color	Noise	Interior Walls	Exterior Walls	Floor Swept	Floor Mopped	Graffiti	Graffiti Removal	Furniture	Ground
Islamic Education	-.438*	.127	-.13	.126	.023	-.057	-.011	-.120	-.180	.037	.105	-.052	.208
Arabic Language	-.428*	.104	-.26	.128	.053	-.094	-.188	-.106	-.148	.303	.191	.067	.125
English Language	-.466*	.156	-.24	.210	-.013	-.094	-.123	-.156	-.212	.281	.258	.183	.205
Mathematics	-.502*	.111	-.25	.187	-.065	-.047	-.175	-.114	-.145	.211	.159	.089	.103
Physics	-.499*	.152	-.24	.176	-.071	-.079	-.107	-.190	-.201	.206	.209	.009	.046
Chemistry	-.557*	.110	-.11	.067	-.191	-.161	-.183	-.219	-.253	.214	.151	.066	.033
Biology	-.415*	.212	-.23	.187	-.167	-.006	-.117	-.094	-.185	.192	.236	-.044	.155
Sciences Curriculum composite Score	-.509*	.140	-.23	.168	-.072	-.084	-.152	-.156	-.197	.234	.200	.069	.114

* $p < .05$

Correlations Between Building Conditions of Girls' Schools and Student Achievement in All Subjects in Art Major

	Building Conditions N=28											
Achievement	School Age	Roof leak	Wall Color	Noise	Interior Walls	Exterior Walls	Floor Swept	Floor Mopped	Graffiti	Graffiti Removal	Furniture	Ground
Islamic Education	.018	-.091	-.157	.008	.232	.013	-.019	.066	.095	.135	-.152	-.217
Arabic Language	-.421*	-.059	-.142	.081	.110	-.098	-.028	-.048	.169	.153	-.074	-.095
English Language	-.407*	.013	.035	-.048	.042	-.242	-.191	-.181	.139	.050	.147	.155
French Language	-.319	.110	.110	-.112	.087	-.248	-.280	-.338	.037	-.024	-.023	.165
History	-.402*	.028	-.010	.086	.153	.011	-.145	-.151	.281	.124	-.044	.048
Geography	-.412*	.113	-.033	.223	.070	-.056	-.239	-.217	.250	.099	.087	.187
Philosophy	-.190	.129	-.023	-.085	.234	-.052	-.034	-.065	.132	.175	-.155	.042
Psychology	-.450*	-.094	.103	.132	.127	.052	-.098	-.088	.023	-.089	.004	-.051
Arts Curriculum composite Score	-.382*	.032	-.022	.014	.126	-.144	-.170	-.170	.174	.099	.005	.074

* $p < .05$

Correlations Between Building Conditions of All Schools and Student Achievement in All Subjects in Science Major

Achievement	Building Conditions N=56												
	School Age	Roof leak	Lab Age	Wall Color	Noise	Interior Walls	Exterior Walls	Floor Swept	Floor Mopped	Graffiti	Graffiti Removal	Furniture	Ground
Islamic Education	-.083	.345*	.270*	.235	.237	.019	.084	.025	.154	.410*	.330*	-.015	.282*
Arabic Language	-.188	.4201*	.254	.243	.285*	.026	.041	.019	.054	.519*	.412*	.157	.262
English Language	-.229	.428*	.301*	.298*	.221	.052	.022	-.031	-.021	.505*	.500*	.160	.291*
Mathematics	-.236	.467*	.325*	.292*	.216	.067	.045	.020	.018	.502*	.436*	.204	.257
Physics	-.163	.469*	.333*	.318*	.214	.017	.042	-.007	.033	.473*	.447*	.141	.262
Chemistry	-.265*	.463*	.362*	.235	.166	-.007	.021	-.057	-.008	.450*	.428*	.148	.204
Biology	-.128	.439*	.305*	.295*	.194	.081	.112	.056	.114	.469*	.458*	.100	.275*
Sciences Curriculum composite	-.194	.461*	.330*	.291*	.219	.038	.048	.010	.048	.501*	.453*	.149	.275*

* $p < .05$

Correlations Between Building Conditions of All Schools and Student Achievement in All Subjects in Art Major

	Building Conditions N=56											
Achievement	School Age	Roof leak	Wall Color	Noise	Interior Walls	Exterior Walls	Floor Swept	Floor Mopped	Graffiti	Graffiti Removal	Furniture	Ground
Islamic Education	.145	.196	.089	.207	.030	.066	-.013	.212	.277*	.142	-.041	.152
Arabic Language	-.036	.229	.195	.325*	.015	.034	-.013	.061	.401*	.254	.066	.205
English Language	-.104	.329*	.264*	.299*	-.044	.015	-.113	.112	.361*	.264*	.222	.252
French Language	.008	.340*	.231	.229	.015	-.022	-.229	-.028	.287*	.171	.113	.302*
History	-.006	.273*	.186	.295*	.003	.107	-.070	.055	.400*	.231	.122	.248
Geography	-.001	.280*	.105	.204	.028	.041	-.127	.083	.374*	.185	.088	.217
Philosophy	.102	.283*	.161	.170	.066	.059	-.017	.121	.394*	.268*	-.010	.321*
Psychology	-.004	.215	.137	.231	.043	.107	.031	.218	.255	.146	-.023	.151
Arts Curriculum composite Score	.007	.308*	.206	.284*	.008	.045	-.086	.113	.392*	.244	.102	.266*

* $p < .05$

VITA

Vita May 2002

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M.Ed. Summer 1998	Ohio University-Athens Major: Educational Administration
Ph.D. Spring 2002	Virginia Polytechnic Institute and State University Major: Educational Leadership and Policy Studies

Experience

Administrative Researcher 95-96	Cultural Relations and Scholarship Department-Office of Vice President of Scientific Affairs Kuwait University

Honors/Awards

- Graduate School Tuition Scholarship	Fall '96-present	Kuwait University
- Committee Member	'94-'96	Counseling Committee of Student Affairs
- Highest Distinction & Honors	'91-'95	College of Education-Kuwait University

Memberships

Council of Educational Facility Planners, International Fall '99-'2002