AN ASSESSMENT OF THE QUALITY AND EDUCATIONAL ADEQUACY OF EDUCATIONAL FACILITIES AND THEIR PERCEIVED IMPACT ON THE LEARNING ENVIRONMENT AS REPORTED BY MIDDLE SCHOOL ADMINISTRATORS AND TEACHERS IN THE HUMBLE INDEPENDENT SCHOOL DISTRICT, HUMBLE, TEXAS

A Record of Study

by

DOUGLAS MATTHEW MONK

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

December 2006

Major Subject: Educational Administration

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Approved by:

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ABSTRACT

An Assessment of the Quality and Educational Adequacy of Educational Facilities and Their Perceived Impact on the Learning Environment as Reported by Middle School Administrators and Teachers in the

Humble Independent School District, Humble Texas. (December 2006)

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This quantitative study investigates the adequacy and quality of middle school facilities in Humble ISD middle schools as reported by the primary users of these facilities, the teachers and administrators. These middle school educators also provide an assessment of the impact that these facilities have on the learning environment. This study also assesses the quality and adequacy of these middle school facilities through a purely quantitative evaluation conducted by an unbiased assessment team. Humble ISD is undergoing unprecedented growth at all levels and has addressed the burgeoning elementary and high school aged growth occurring in the district by constructing and renovating these facilities. At the middle level, however, new facility construction is occurring at a slower pace. The purpose of this research is to ascertain which factors in each of these six facilities have the greatest quality and adequacy and the impact that they have on the learning environment. Furthermore, it is the purpose of this research to provide valuable and practical data, to which Humble ISD and others can refer in

developing future building plans, renovating existing facilities, allocating funds, and creating student centered learning environments. This study also investigates the relationship between what educators perceive as adequate and quality facility factors and their perception of the impact that these factors have on the learning environment. Finally, this study reviews any congruency or agreement between educator's perception of adequacy and quality and architect assessment of adequacy and quality. Middle level students are the most influential group of adolescents and it is important that we provide facilities that meet their very specific needs. This research will ultimately and positively impact the learning environment for these children.

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CHAPTER I

INTRODUCTION

The earliest educational reformers in the United States realized the impact that educational facilities had on the learning environment. They understood that a high quality, adequate physical learning environment depended on appropriately designed school buildings. It was not until 1865 that we see a conscious, organized effort to create quality, adequate school facilities that positively influence the programs inherent to an effective learning environment (Loughlin and Suina 1982). Furthermore, educational research did not reach a level of sophistication until 1908 that would show a more specific need. An entire cross section of children, the most developmentally fragile group, needed middle level facilities. Research on adolescents from this time through the present has shown that the group of children between the ages of 10 and 15 years old is a special age group with unique needs. While there has been extensive research on the characteristics of the middle level child, information is limited on the educational facilities needed to meet the needs of the middle school child (O'Neill, 1999). These points are clear within this context:

1. Educational facilities have an impact on the learning environment for children. This has been understood since the early days of educational facility planning in the United States.

This thesis follows the style of the *Journal of Educational Research.*

2. Middle level children between the ages of 10 and 15 have very distinct developmental characteristics that mandate high quality, adequate, and responsive educational facilities.

3. There is a gap in the literature between what is known about high school children's' characteristics and facility needs and elementary children and their facility needs. Information is needed on what specifically makes an adequate, high quality educational facility at the middle school level (O'Neill, 1999).

This gap in information is further exacerbated by current trends in educational facility construction. In 2004, the nation's school districts spent 5 billion dollars on new high schools, 4.6 billion on new elementary schools, and 2.5 billion on new middle school construction. In the Texas region, construction and renovation funding portioned towards middle schools lags far behind high and elementary schools.

This research will contribute to the closure of this gap in middle school facility responsiveness, educational quality, adequacy, and design. The review of literature discusses the history of educational facilities design related to quality and adequacy. When considering these aspects of middle school facilities, the middle level customer's requirement for these facilities is explored. Specific quality and adequate middle level facility characteristics are also presented. In conducting research on what constitutes high quality and educationally adequate middle school facilities, two instruments are used to gather specific perspectives from teachers using the middle school facilities and architects who design and manage these facilities. These instruments measure the quality and educational adequacy, or effectiveness, of middle level facilities. They take

into account six areas common to all levels of educational facilities: The school site; structural and mechanical features; plant maintainability; school building safety and security, educational adequacy, and environment for education (Hawkins and Lilley, 1998). Harold Hawkins and Edward Lilley developed the *Council of Educational Facility Planners International* (CEFPI) *Instrument for Middle School Appraisal* in 1998. They developed an instrument for high, middle and elementary schools that measure the quality and educational adequacy of school facilities. It is administered by unbiased administrators and architects who reach consensus on scores in the aforementioned six areas. David O'Neill developed the Total Learning Environment Assessment (TLEA) Middle School Version in 1999 from the CEFPI instrument under the tutelage of Hawkins and Lilley. It measures the perception of adequacy and quality from teachers using these facilities through a survey process. Additionally, in this study, a correlation is conducted to determine if there is a relationship between what teachers in middle school facilities perceive as adequate and high quality and their perception of the impact that these factors have on the learning environment. In this manner, gaps in understanding and perspectives between building users and builders can be considered and closed. Future school buildings must provide learning environments that maximize the ability of students to learn and teachers to teach. The relationship between educators and architects, as history has shown, must produce facilities that are responsive to the educational plan of the district (Boggio, 2004). These two instruments serve as useful tools in determining an additional area of inquiry. When we look to future construction of middle school facilities in the subject-district of this study and others, data about what

is adequate and high quality must be existent. These instruments provide a permanent record that will reveal correctable problems that may have been previously overlooked. The specific sections in each instrument can be sources of information for areas needing separate consideration for enhancement. This information can also be used as a precursor to the development of a new school building program. The question of whether to renovate or abandon may also be answered using the data gathered from these data sets (Hawkins and Lilley, 1998). In sum, this study will close the gap on a question that has intrigued and troubled educators and architects for centuries. This is especially pertinent when we consider that educational facilities can positively impact the most transitory group of children, the middle schooler (Roeser, Eccles, and Sameroff 2000): Are educational facilities of high enough quality and adequacy to support the educational program and the learning environment?

Statement of the Problem

Lewis (2000) studied 139 schools in the Milwaukee public school system. In his study he found a positive relationship between facilities design and the learning environment in those schools. That researcher found that facility condition impacted the learning environment more than socio-economic variables. A similar study cited by Black (2001) in Washington DC found a similar correlation between educational facilities design and the learning environment. Cain, Cain, and Crowell (1999) posited that children's brains perceive the world peripherally as well as directly. That is, while they may directly and congnizantly make meaning of their learning environment, they are also affected at a subliminal level by their physical setting. This research showed

that the learning environment profoundly influences children. They are affected by color, acoustics, building arrangement, room organization, and all the factors that make up the physical learning environment. These cited findings mandate the careful, thoughtful planning, constructing and renovating of children's learning environments. Humble ISD is a district in North Harris County that is facing massive growth in student numbers with a soft tax base and academically demanding constituents.

A recent demographic study by Kris Seigert (2004) concluded that Humble will grow from 27,000 students to 39,500 students by 2013. This demographic study concluded that Humble ISD will need 9 elementary schools, 3 middle schools, and 1 new high school in that time frame. With research that indicates a positive relationship between facility design and the learning environment, Humble ISD must build new facilities and renovate the old so that they enhance rather than detract from the learning environment (Black, 2001). Specific research at the middle school level on this subject is lacking however as indicated by O'Neill (1999).

Purpose of the Study

The purpose of this study is four-fold. First, this study will determine the quality and educational adequacy of Humble ISD middle level educational facilities and their impact on the learning environment as reported by middle school teachers and administrators on the TLEA survey instrument. Second, this study will measure the quality and educational adequacy of middle level educational facilities in the Humble Independent School District as assessed by an architect team using the Council of Educational Facility Planner's Int'l (CEFPI) Guide for School Facility Appraisal

Instrument for Middle School Appraisal (Hawkins and Lilley, 1998). Third, this study will determine the relationship between the perceived quality and adequacy of the HISD middle level facility and the perceived impact that these facilities have on the learning environment as reported by educators in those facilities. Finally, it will investigate any congruence between the results from the TLEA and CEFPI instruments. The variables in this study are described by Marjoribanks (Keeves, 1988) as the alpha press which is the environment as it actually exists as much as scientific methods can discover and the beta press which is the subject's perception of their environment. The study will provide valuable and practical data upon which this district and others can refer in developing future building plans, renovating existing facilities, allocating funds, and creating student centered learning environments. With the state school-funding crisis looming over districts in the state, construction costs rising, taxing at its cap in many districts, and the increasing demand on academic quality ever increasing, school districts must design quality educational facilities that are conducive to learning, especially for middle school children. (Lyons, 2002). This study will provide insight on the perceived impact that middle school facility quality and adequacy has on the middle school learning environment.

Research Questions

This study seeks to answer the following questions:

1. What is the perceived educational adequacy and quality of Humble ISD middle level educational facilities and what is the impact of these facilities on the learning environment as reported by middle school teachers and administrators on the TLEA

survey instrument?

2. What is the quality and educational adequacy of middle level educational facilities in Humble ISD as determined by the CEFPI Appraisal Instrument for Middle Schools.

3. What is the relationship between the perceived educational adequacy and quality of the HISD middle level facility's as reported by teachers and administrators on the TLEA and the perceived impact of these facilities on the learning environment as reported by teachers and administrators on the TLEA?

4. Is there congruency between the perceived adequacy and quality of middle school facilities as reported on the TLEA survey for educators and the quality and adequacy as assessed by the CEFPI instrument for architects?

Operational Definitions

The findings in this study are to be reviewed using the following operational definitions:

Building Maintainability: This refers to those aspects of a building, which make possible the extended life of the building at reasonable cost. The characteristics of the building that relate to maintainability are design, construction materials, durability of fixed equipment, floor coverings, interior wall and ceiling materials, and hardware and fixtures. (Hawkins and Lilly, 1998)

Congruency: The level of agreement between perceived adequacy and quality of a facility and the assessed adequacy and quality of a facility

***Council of Educational Facility Planners International* (CEFPI) *Instrument for Middle School Appraisal*:** This is an appraisal instrument that measures the quality and

educational adequacy of middle level educational facilities. There are 97 questions about specific areas in an educational facility, which are assessed with an additive score by a six point Lickert scale, which measures for adequacy (Hawkins and Lilley, 1998) (See Appendix B).

Educational Facility Adequacy: The extent to which the school meets the educational needs of a community and a school district (Hawkins and Lilley, 1998)

Educational Facility Quality: The level to which the school supports the learning environment and educational programming.

Educational Effectiveness: The extent to which the physical plant serves the instructional program (Hawkins and Lilley, 1998).

Educational Facilities: The buildings and grounds that house and support the instructional programs of individual campuses.

Educational Facility Design: This refers to the interior and exterior structure, physical plant, and appearance of the facility.

Facility Characteristics: These characteristics include the school site, structural and mechanical features, plant maintainability, school building safety and security, educational adequacy, and environment for education. (Hawkins and Lilly, 1998)

Facility Modification: Any alteration to the structure and characteristics of existing facilities.

Humble ISD: This district is in Northeast Harris County and is approximately 20 miles North of Houston Texas. It is a district with 28,000 students and 3,000 employees.

There are three high schools, six middle schools, and 24 elementary schools. The district lies in three principalities: City of Humble, City of Houston, and Harris County.

Impact (of building design): The influence that the physical aspects of a school have on the learning process.

Learning Environment: This is the environment for education, which includes the physical aspects of the school that affect the learning process. (Hawkins and Lilley, 1998)

Middle School Educators: This is the Professional Staff at each middle school comprised of Teachers, Administrators, and Support Staff.

Total Learning Environment Assessment (TLEA) Middle School Version: This is a survey instrument that measures the level and areas of impact that an educational facility has on the learning environment. It consists of 82 questions about specific areas in an educational facility and rates each one using two, four point Lickert scales, one measuring respondent perception of a facility's educational adequacy and quality and the second measuring respondent perception of perceived impact (O'Neill, 1999) (See Appendix A).

Assumptions

1. The educators understand the purpose of the survey instrument and will answer the questions to the best of their ability.
2. The researcher and district architect will be impartial in collecting and analyzing the data gathered.

3. The person who receives the instrument or their designee from Humble ISD middle schools will be the individual that completes the instrument.

4. The person who receives the instrument has sufficient computer knowledge to complete the instrument electronically and can email it back to the researcher.

Limitations

1. Findings from this study may not be generalized beyond the middle schools in Humble ISD participating in the study.

2. Only administrators and teachers during the 2005-2006 school year at Humble ISD middle schools will be surveyed.

3. Objectivity of the responses to the survey instrument may be affected by personal biases of the teachers and administrators completing the instrument.

4. This study is limited to the information acquired from the literature review and the two survey instruments.

Significance of the Study

Humble ISD is facing unprecedented growth in population, facilities, and programs in the next three to five years. (Kris Seigert, 2004) This district and many others faced with similar challenges must be prepared with current findings to address the needs of their students. Research done by Black (2001) and Lewis (2000) on facilities design supports a positive relationship between facility design and the learning environment. The findings in this study will provide current, applicable data on this relationship so that growing districts such as Humble ISD can effectively address middle school student learning needs with appropriate facilities. Understanding the adequacy,

quality, and impact that our current educational facilities have on learning environments can guide facility renovations and the construction of new facilities to be conducive to learning.

Dissertation Overview

In Chapter II, the literature will be reviewed and will present the history of school building design and the learning environment, characteristics of the middle level child, what young adolescents need in a high quality and adequate learning environment, how the learning environment is impacted by the educational facility, current educational building trends, the learning environment defined, ambient factors, and the quality and adequate classroom. Chapter III will outline the methodology of the study by research question, collection of the data, analysis of the data, and assumptions and limitations of the study. Chapter IV will describe and discuss the results of the study through analysis of the data gathered in the process of answering the four research questions in Chapter I. Chapter V will summarize the results of this study and respond to research question four in the form of recommendations for modification of middle school facilities in Humble ISD.

CHAPTER II

REVIEW OF THE LITERATURE

In 1838 Horace Mann, the secretary of the Massachusetts Board of Education made this statement in his first annual report:

"Schoolhouse design is closely related to the love of study…..proficiency, health anatomical formation and length of life. These are great interests and therefore suggest great duties." (Cutler, 1989, pg.4)

The organization of this record of study and review of literature will focus on the philosophy of Horace Mann more than one hundred and sixty years ago. The decisions we have made, are making, and will make about school facilities impact the daily performance of teachers and students. Decisions about school facilities design can positively affect long-term academic achievement. (Schnieder, 2002) The physical learning environment in these facilities is formed by the relationship between the architectural facility and the arranged environment. (Loughlin and Suina, 1982)

In order to better understand the impact that educational facilities have on the learning environment, this literature review will first provide an historical perspective of this relationship. The philosophy about the learning environment has evolved greatly since the formation of this country and understanding where we have been in terms of the learning environment and school design will give a clearer understanding of where we are today (Kowalski, 2002). Just as important as a historical understanding is an understanding of the customer that uses facilities and is impacted by them. This study will provide characteristics of that customer, the young adolescent learner. The middle

school child has specific physical, emotional, social, and developmental needs that are impacted by the environment in which they learn. (Finks, 1990) The final section examines the definitions and characteristics of the learning environment and critical areas of educational facilities.

Historical Perspectives of School Building Design and the Learning Environment

The impact of educational facilities on the learning environment became a focal point for educational reformers from the earliest days of the United States (Cutler, 1989). Modern research continues to verify that educational facilities have an impact on the learning environment and student achievement (Stevenson, 2001). Educational reformers such as Thomas Jefferson, Horace Mann, John Dewey, Jacob Riis and Henry Bernard understood that a quality physical learning environment depended on appropriately designed school houses (Loughlin and Suina, pg. 15). In order to understand the rationale for designing modern facilities that positively impact the learning environment there must be an investigation of the history of educational facilities and their impact on the learning environment. This investigation will begin with the formal inception of the United States.

1776-1830

Prior to the formation of the United States, and as early as 1647, the impetus for school construction came from the House of Burgesses. Laws were passed at this time mandating that colonial towns establish and build elementary schools (Button and Provenzo, 1989). The earliest schools in America indicate that the setting in which education occurred was a low priority. These one-room schoolhouses as they were

known were built from local materials whose primary purpose was to protect the children and teacher from the elements. "Americans believed the setting was of little consequence. Schools were plain, wooden and meant for protection from the elements. The school site was usually on wasteland, not suitable for farming. The ceilings were low, ventilation bad, lighting unsatisfactory, heating uneven and sanitary arrangements often unmentionable." (Kowalski, 2002, pg. 4) In the 1700s, schools were built within sight of their villages due to the threat of predacious animals on children and unfriendly native tribes. Desks were commonly sticks driven into the log walls to create shelves for desks. Desks as we know them were not invented until the early 1800s. Often, floors were used as black boards and lessons were presented here until the advent of wooden planked flooring. Foot warmers were used by students and teachers to avert frostbite. Wood storage sheds were often larger than the school building itself. It was a common expectation for children to bring wood to school. Those who brought the most were given preferential seating and treatment. The common heating element of the time was the wood-burning stove, which was the responsibility of the boys in the class. A typical classroom had children aged 4-17. Open windows provided indoor lighting. (Sloane, 1972) One teacher was assigned to all grade levels and, consequently, all children heard all lessons and were allowed to work at their own pace. A student in 1779 was quoted as saying "One room school houses offered almost unlimited opportunity for gifted students to advance." (Graves, 1993, pg. 22). This early open concept allowed for lower grade students to master upper grade level material.

After 1776, most loyalist schoolmasters fled the country for fear of political prosecution. This left the church as the primary organizer of education. During this time, school offering was something like the free market. Parents chose the school they thought was best for their child (Button and Provenzo, 1989). As a result, from 1776 to 1800, private, for profit schools were common. The poor urbanites were left with church schools. This fit the public sentiment of the time which was that education was a moral issue. At this time, deliberate cultural nationalism and the re-establishment of democratic consciousness occurred. The House of Burgesses ruled against a bill proposed by Thomas Jefferson for The More General Diffusion of Knowledge in 1779. This philosophy was supported by a well-known physician of the period, Benjamin Rush. Together, Jefferson and he envisioned a system that would have provided for a three-tiered program for free general education and uniform education for the masses. It was not until the 1830s that widespread support for this type of public schools developed (Button and Provenzo, 1989). In 1790, Robert Owen, a reformist from Indiana, built several town schools based on the design of the Swiss educator Johann Pestalozzi. His schools functioned under the philosophy that "Men were neither born good nor evil but instead shaped by the environment in which they live." This was to be the cultivation of the idea of providing children with healthy and supportive learning environments. (Button and Provenzo, 1989 pg. 71) Through experiments such as these and the foresight of men like Thomas Jefferson, education was transformed into a well-organized enterprise by 1800.

In the early 1800s through 1830, schoolhouses and the learning environment continued to change, influenced by many conditions (Kowalski, 2002). The influential Lancastrian learning environment developed during this time. It had its roots in England and peaked in the late 1820s. In this system, one teacher had 50 or more student monitors who, in turn, taught 10 students in large instructional halls. This was, in effect, a giant one-room schoolhouse of 500 children. These great halls were common in cities and were typically 50 feet by 100 feet in size with rows of benches for students. Teaching took place in clusters around the perimeter of the classroom. Although this concept lost support, it paved the way for the first, free, public, tax supported schools. In rural settings however, the one-room schoolhouses continued to be used. (Button and Provenzo, 1989)

1830-1865

In 1830, the country saw a drop in the agricultural industry and an increase in industrialization. This caused a drop in agricultural workers from 58% of the workforce to 15% of the work force. Much of this 58% was made up of school-aged children. This shift caused a massive influx of school aged children into the infantile school systems (Button and Provenzo, 1989). The 1830s also saw an enormous influx of immigrant populations. Education of these immigrant children was seen as the only tool for assimilation of these masses. Commensurate with these two surges was a change in public sentiment. There was a surge in the power of the common man, social equality, and coherent nationalism. Americans began to see and prioritize a free, public education

for their children. This was the idea proposed by Thomas Jefferson and Benjamin Rusk fifty years earlier.

Industrialized states such as New York, Massachusetts, and Pennsylvania enacted the Common School movement in response to the changing American mindset (Button and Provenzo, 1989). This, in turn, caused the creation of local districts. This was the technical term of the time for an area from which a child could feasibly walk to school. Citizens in these districts began levying their own taxes, appointing teachers, setting the length of the school year and maintaining their school buildings. The goal of the common school was to provide an equalizer for citizens to the new republic, personal development and education for individuals, and stability among members of society.

In 1830, the American Institute of Instructors held a national contest for the construction of the best schoolhouses. This was the beginning of a national interest in the importance of schoolhouse design. From this movement, the first publicly funded elementary school opened in 1833 (Button and Provenzo, 1989). Henry Barnard introduced a bill to the legislature in 1838, which created a Board of Commissioners to supervise common schools in the country. (Cutler, 1989) With this supervisory group, standardized school design and construction came about. As the common school philosophy moved forward, districts and towns began consolidating their one-room schoolhouses into larger schools in 1840. Seeing the need to standardize quality school house construction, Henry Barnard wrote in Volume 2 of the Connecticut Commission School Journal that, “Every village, town and school in Connecticut would have at least one edifice in good taste, in a conspicuous and agreeable situation, a correct model of

architecture pleasing to the eye of every spectator and agreeable to those for whom the school house was designed." (Button and Provenzo, 1989 pg. 114) He also published *School Architecture: Or a Contribution to the Improvement of School Houses in the US*. With this document, Barnard was instrumental in moving the country forward with the educational philosophy that schools were sacred places that had an impact on the learning environment for children. (Cutler, 1989)

Horace Mann, an instrumental school reformer came to power as the Secretary for the Board of Education of Massachusetts from 1837 to 1850. He popularized the connection between educational environment and school design. He believed that the influence of the school building on the learning environment was such that student outlooks and sensibilities were broadened, not narrowed. This influence, he believed, fueled the growth of individuals and society (Hansen, 2002, pg. 1). Mann believed that schools must be one of the most attractive buildings in the neighborhood to increase enrollment. He further believed that there was a direct connection between the design of a school building and mastery of the curriculum. It was during this time that school architects were more commonly used to design schools based on educator input (Cutler, 1989).

In 1848, a school was designed and built in Boston. The Quincy Elementary School was the first graded school and it influenced the design of educational facilities henceforth. (Graves, 1993) It housed 660 students in 16 classrooms who were separated by grade level. Each classroom held 55 students and measured 31 feet by 22 feet. It boasted state of the art desks that were bolted to the floor in seven rows of eight desks

each. The top floor housed one of the first auditoriums for the entire student body. This design was so successful that it coined the phrase the "Quincy Plan" of school design. Up until this time, most schools had two large study halls with seats for every student, separated by a central hallway (Cutler, 1989). Within two years St. Louis, New York, San Francisco, New Orleans, New Haven, Louisville, and Cincinnati had common schools of the Quincy School design (Graves, 1993). The Quincy School further suggested the philosophy that well planned educational facilities could have a positive impact on the learning environment. Yet, 70 years later there were still 200,000 one-room schoolhouses in the country (Cutler, 1989).

Rural America began adopting this idea in the 1850s. In 1859 James Johonnot wrote an influential guide for rural schools entitled Country School Houses. In it he emphasized the need to have "grade level instruction and the architecture to support it." (Cutler, 1989, pg. 6). Even with all the gains in school facilities design, the learning environment in rural schools was, noted Johonnot, "unhealthy for children, they were required to work in buildings with inadequate light, heat, air, space or sanitation." (Cutler, 1989, pg. 7). Horace Mann noted that the city schools were not much better at this time. Mann stated that, "such conditions serve to retard the progress of public education." Brubaker (1998) noted that buildings of the time were constructed of brick walls, axial floor plans, of 2 to 4 stories, with a predominant Gothic architecture. By 1860 there were only 300 High Schools in the country. Mann noted while inspecting these schools through the 1860s that most were inadequate, neglected, and dilapidated. (Cutler,1989, pg. 7). During the years of 1855 to 1865 Horace Mann and other

educational leaders made a grass roots movement to change schools and their learning environments noting, "school construction is riddled with politics, corruption and incompetence."

1865 -1900

As part of this grass roots movement after the Civil War, Horace Mann and many un-corrupted community leaders began to bring the construction of schools under centralized, professional and expert control (Cutler, 1989). Commensurate with and supportive of this movement, John Dewey and William Jones questioned the current, formulaic style of education. They proposed that education should be based on the application of life processes, learning by manipulation, participation, and cooperation. This caused a shift in pedagogy and the education process. Discussion, analysis, investigation, group work, and self-expression came into popularity. This shaped the way that school buildings were being designed. It necessitated small groups, which, in turn, necessitated smaller classes and more space for cooperative learning (Graves, 1993). Here we see a connection with the modern belief that the physical environment must be arranged to positively influence the programs inherent to an effective learning environment (Loughlin and Suina, 1982). Thus, during this period between 1865 and 1900 new subject matter was added such as geography and science. This greatly influenced the internal design of schools. Once bolted desks were made moveable and more space was allocated to support group interaction (Graves, 1993).

It was also during this period that laws governing attendance were passed. In 1865 Massachusetts and Illinois passed laws that required children between 8 and 14 to

attend school at least 12 weeks per year. This opened the door for other states to follow in their path (Button and Provenzo, 1989). This change in educational philosophy and the learning environment was the impetus for home like kindergartens by the 1870s. By 1873 the first public kindergarten opened in St. Louis (Graves, 1993). In 1872, there was a growing concern over the development of young adolescents and their place in the education system. A Committee of Ten on Secondary School Studies was formed to analyze this point and others related to middle level schools (George, 1992). This was all bolstered by a psychological turning point for the American people in 1876. The United States had become a major social and political power in the world with a population 10 times what it had been 100 years earlier (Button and Provenzo, 1989).

In the 1880s, "manual training" classes, or Industrial Tech. classes were implemented in high schools. This mandated newly designed classrooms with machinery and tools (Cutler, 1989). Home Economics, Biology, Chemistry, Art, Music and Wood Shop classes all had their beginnings during the 1880s and 90s. These new programs necessitated the addition of laboratories, studios and full student body auditoriums to schools at this time (Cutler, 1989). In the 1890s, a whole generation of urban leaders and reformers supported educational facilities that positively impacted the learning environment. Dwight H. Perkins voiced this in his address to the National Education Association when he stated, "In schools, more than any other class of building, needs should govern structure and form." (Cutler, 1989, pg. 27)

As school construction in support of this idea became more focused and organized, districts began hiring architects. In 1891, CBJ Snyder was Superintendent of

School Buildings for New York City and he upgraded the entire physical system. He developed the "H" shaped school to provide natural lighting in all rooms and fresh air to all corners of the building. He introduced electricity, phones, large kindergartens, and moveable furniture. His efforts spearheaded the movement that only professionals should produce effective schools and learning environments (Cutler, 1989). This was not the norm however. During the 1890s, schools lacked any landscaping or grounds beautification. Most schools were 10 to 16 room schoolhouses on three floors which were built on quarter acre plots. The exterior of these buildings was adorned with Victorian flourishes to attract parents and children (Brubaker, 1998).

In 1893, young adolescent athletes from Europe humbled America during the Columbia Exposition. It was also at this time that the Committee of Ten recommended a clear middle level division in the education system. Their recommendation started the movement towards building separate middle schools (George, Stevenson, Thomason, and Beane, 1992). These events brought about the development of physical education classes in the high schools. This, in turn, caused the construction of physical education facilities in schools during this period (Graves, 1993). In 1894, a National Learning Lab was established to study the science of education and more importantly, the documentation of child behavior related to the learning environment. The impact of physical facilities on the learning environment was a source of great interest and priority as the country entered the new century (Button and Provenzo, 1989).

1900-1920

In 1900 there were 6,000 high schools in the country compared to 300 in 1860. (Graves, 1993) By 1904, 78.7% of 5 to 17year olds attended schools. New inventions and child labor laws eliminated the need for child labor (Button and Provenzo, 1989). As industrialization caused a mass exodus from the country to the cities, school enrollments grew dramatically. The effect was two-fold. This caused the separation of elementary and secondary children and eventually the formation of the first Junior High school in 1908 in Columbus, Ohio (Manning, 2000a). It had 18 rooms and no special teaching equipment (Smith, 1938). It also had the effect of formalizing, organizing, and zoning of school districts (Kowalski, 2002).

This newly defined group of adolescents required a new understanding. During the early 1900s, noted psychologist, Stanley Hall studied and defined adolescence as a recognized stage of human development. His study also showed the importance of playtime in the development of children. Accordingly, the construction of playgrounds at schools expanded dramatically (Button and Provenzo, 1989). The Progressive Movement towards the efficient management of schools began in 1913 with the urging of the Secretary of Public Education, Jacob Riis. The growing enrollment in schools necessitated a factory style of management popularized by Fredrick Taylor (Button and Provenzo, 1989). Efficiency became the rule of the day for school managers (Kowalski, 2002). This started the "per pupil" model for funding that we know today. In 1918, the "Gary Plan", named after the steel magnate Elbert Gary, gained acceptance as a preferred method for systematically managing schools. This plan focused on the

maximum usage of school spaces and it is during this time that class changes and class periods arise (Button and Provenzo, 1989).

By 1918 general science classes were required which caused the standardization of science lab design and construction. Physical fitness became an important, common, and required course with the advent of World War I. Facilities to support physical education programs emerged at this time (Kowalski, 2002). Southern states were beginning to move forward in educational awareness. A major milestone was the passing of mandatory attendance laws in Mississippi in 1918. The burgeoning enrollments and the factory model facilitated the conversion of existing buildings into schools. Cities such as Boston and Tacoma converted factories, stores, and warehouses into schools (Graves, 1993). However, in Houston, Texas, the newest Jr. High Schools came equipped with swimming pools, shops, kitchens, laboratories, and gymnasiums. These schools were experiencing a 23% increase in enrollment in 1915 (Horn, 1915). By 1920, the explosive growth in student enrollment and the concurrent school building boom mandated that central office administrators take over roles in facility design (Kowalski, 2002).

1920-1950

In the 1920s it was a common belief among cooperating educators and architects that, indeed, school facilities affected the learning environment. During this period between 1920 and 1950, educators came to believe that the design of the schoolhouse directly influenced student mastery of the curriculum (Cutler, 1989). The combination of this philosophy and increased enrollment caused an expansion of school systems until

the 1930s (Graves, 1993). The depression years caused great difficulty for schools and their districts. The most severely effected region was the Southern states region. Because southern schools were already poor and decrepit, many closed during the 30s never to re-open (Button and Provenzo, 1989). Most districts and schools did survive as did many philosophies on education and the learning environment. The Gary plan remained a powerful force through the 30s and survives to this day (Button and Provenzo, 1989). During the 1930s there was a shift in focus from the child to a focus on teaching techniques, educational programs, and innovations (Cutler, 1989). An area of positive influence occurred in regulation. During the 30's school safety, hygiene, and fire codes were passed and mandated in schools across the nation. The enforcement of these codes as well as facilities maintenance was left to the state governments (Kowalski, 2002). By 1940 though, most schools and districts had fallen into disrepair (Cutler, 1989).

In 1940, a school was designed and built that would alter school design henceforth. The Crow Island School was built in Illinois and was immediately recognized as a building designed around an environment conducive to learning. The superintendent, Carlton Washburn wanted to "re-direct the learning process and the environment it generated." (Brubaker, 1998, pg. 11) He recognized the importance of how and where to teach and learn. He sat in classes, hallways, and common areas and learned what children wanted in a school. He then applied this to a building centered on learning environments (Brubaker, 1998). It was a small elementary school with classrooms organized into wings. Every classroom had large picture windows with

direct access to private court yards (Graves, 1993). It is referred to as the first modern school and served as a model school nationwide (Brubaker, 1998). It also had the effect of teaming educators and architects as never before. Through the 1940s, this relationship grew dramatically and is considered a recovery period for the learning environment from the depression. During this time, with the Crow Island School as a catalyst, facility design philosophy was that schools must be inspirational to be successful (Blatner, 1948).

Scientific building design based on educational research overcame sentiment. These studies measured light effects, furniture color and shape, and wall coloring that advanced school design. Glass block became a common building material to enhance natural lighting. Modular design was common, and plastics, rustless alloys, pre-fabricated breathing walls, and impregnated woods were preferred building materials (Brubaker, 1998).

1950-1970

By 1950, 79% of teachers and 37% of custodial staffs took part in school planning. Contemporary design was the style of choice through the 1950s. Fifty percent of schools used unilateral lighting, cold cathode tubes, glare control surfaces, acoustical ceilings, and plaster walls. Seventy-three percent of schools were one-story structures with a trend towards cooperative learning and use of multi-purpose rooms. On average, elementary schools were built on 8.7 acres and secondary schools on 18 acres. While the chalkboard was still used, research at the time showed that green boards with white chalk were most effective for an effective learning environment (Herrick and Conrad

1952). By the mid-50s, baby boom children were appearing in elementary schools (Button and Provenzo, 1989). In 1952 there were 2.2 million students in school with a projected 500,000 new classrooms needed (Herrick and Conrad, 1952). This led to a profusion of quickly and cheaply built schools (Graves, 1993).

By 1960 it was clearly understood that properly built schools had a positive impact on the learning process and environment. Yet, in 1960 it became apparent that the past decade of rapid, systematic, modularized school design and construction had resulted in sub-standard schoolhouses. To Americans, this symbolized the serious flaws in the system as a whole (Cutler, 1989). Educational designers and researchers responded with the controversial use of the open concept environment. It supported flexibility and adaptability. A new commitment to education was that all children could learn more efficiently in open spaces. It was believed that this would lead to increased innovation, self-assurance, intelligence, and understanding. This concept was a re-visitation to the one room schoolhouse model (Graves, 1993).

1970-present

By 1970 most new schools were built without walls and in old schools they were torn down. Yet, by the late 70s, the walls were going back up (Graves, 1993). Throughout the late 1960s and into the mid-70s there were many critics and criticisms of elementary and secondary schools (Button and Provenzo, 1989). During this decade, enrollment dropped across the country. A problem caused by this drop was the need to close schools down. Deferred maintenance through the 60s had left schools, once again, in crisis mode. Schools began to fall apart, become inadequate, and unsupportive of an

environment conducive to learning (Brubaker, 1998). Public dissatisfaction with schools seldom in history had been as strong as it was in the 70s and into the 80s (Button and Provenzo, 1989). This led to the publication of *A Nation at Risk* in 1983, which was the objectionable grand criticism of American schools (Button and Provenzo, 1989). School systems looked closely at themselves and their facilities as a result. This renewed interest in appropriate learning environments. However, the facilities that existed at the time not only did not support effective learning environments, they needed renovations, suffered from poor indoor air quality (IAQ), inadequate lighting, ventilation, and the removal of asbestos (Brubaker, 1998). As the 1990s began, a report by the American Association of School Administrators (AASA, 1991) noted that 13% of school buildings nationwide failed to provide an environment that was conducive to learning. A second report from the Government Accounting Office (GAO) in 1996 found that 25% of all students received instruction in buildings in need of extensive renovation or replacement (Kowalski, 2002). Through the 90s there was extensive research on the question of school adequacy and what that means. Smaller schools and schools within schools became, and still are, popular trends. Research has shown that connections with children in learning environments that are intimate and family oriented are most effective (Brubaker, 1998). More than ever, school designers are seeing the chance to increase academic outcomes by creating better learning environments. The research into educational facility design for the new century is extensive and conclusive (Schnieder, 2002). Facilities in the present and near future must create ambient environments that positively impact the learning environment. Future school buildings must provide

learning environments that maximize the ability for children to learn and perform at the highest level possible. The relationship between educators and architects, as history has shown, can and must produce building designs that are responsive to the educational plan of a district (Boggio, 2004).

Middle Level Customers

"Middle Schools have significant influence on the lives of young people that extends beyond the academic domain." (Roeser et al., 2000). In order to understand the impact that educational facility design has on the learning environment at the middle school level, it is critical that we understand the characteristics of the persons most influenced by this arranged environment. The customer, in this sense, is the middle school child. Middle grade students are unique socially, developmentally, physically and physiologically. These characteristics mandate specific needs that are addressed in their learning environments (TEA, 2004). Understanding the specific characteristics of the customer directly influences the realization of the impact that the facilities have on the necessitated learning environment. This section will define the middle school adolescent, developmental characteristics of the middle level adolescent, and identify environmental and learning needs.

What Is a Middle Schooler?

Middle school education is the segment of schooling that encompasses early adolescence, the stage of life between 10 and 15 (TEA, 2004). Adolescents experience biological, cognitive and social-emotional changes amid maturing relationships with parents, peers and teachers. There is frequent exploration into identity, becoming

comfortable with a maturing body and expanding intellectual and social opportunities (Roeser et al., 2000). The children in this transitory developmental stage are considered the most important group of students today. What happens to children between the ages of 10 and 15 can permanently impact what happens to both their academic and social success in the future. In order for educators and facility planners to positively impact these factors, they must understand the young adolescent learner and their unique developmental stages and needs (Bondi, 1993).

A snapshot of young adolescents will reveal common experiences and quantitative characteristics. A common and intimidating change is the movement from the elementary to the middle school. All middle school children begin these years with an exchange of self contained elementary classrooms for and educational setting with one teacher and the same peer group for six periods of changing classes. They move from small neighborhood schools to feeder campuses that are larger and more complex and may serve students from a variety of areas in a town. This transition is typically from a school with 500 to 700 children to middle schools housing between 1,000 and 1,300 students (TEA, 2004).

Equally as intimidating is the transition to a new academic setting that is strange and not as supportive as the elementary setting. Young adolescents are typically sorted based on prior academic performance. This means that middle school students are placed in leveled classes, which, can result in self-esteem problems. In Texas during 2004, 979,000, or 22% of the student population, attend middle grades. Thirty-eight percent are white, 14% black, 43% Hispanic, 2% Asian. This young adolescent group is

largely urban and mobile. 50% of eighth graders live in 65 districts with more than 10,000 students. Some mobility rates are higher than 40% per year. 25% of eighth graders are home in the evenings for 2 hours without adult supervision. 18% of all eighth graders repeat a grade and 27% of 6th, 28% of 7th and 30% of eighth graders are overage for their grade in 1990 (TEA, 2004). In 2004 90% of eighth graders, 83% of seventh graders and 87% of sixth graders passed the reading portion of the TAKS test. On the math portion, 67% of 8th, 67% of 7th, and 78% of 6th graders passed. Considering the grades on all portions of the TAKS test, 64%, 66%, and 74% of 8th, 7th, and 6th graders passed respectively (TEA, 2004). In general, performance in areas of English and math decline during this difficult transition into middle schools. Academic preparation is most inadequate among the poor, minority, and immigrant middle school populations. Consequently, these young adolescent groups typically attend the weakest and most overcrowded schools (Jackson and Davis, 2000).

Characteristics of Young Adolescents

Young adolescence is a period of rapid physical, intellectual and social change. This period is now believed to be a critical point in human development (Finks, 2002). Physical changes enable the child to have sexual relations and reproduce. It is a time of vulnerability, emotional pain, humiliation, and anxiety. It is also a period of discovery commensurate with an increased ability for complex thinking. Entry into middle school can itself be stressful. Students move from elementary school to less supportive middle school environments. This often results in lowered self-esteem (Jackson and Davis, 2002). Research by Anderman and Midgley (1997) suggests that motivation and

performance declines in middle school children unless the learning environment is a positive and supportive one.

Young adolescents go through more rapid and profound personal change during 10-15 than any other period of life. These changes present challenges for teachers and parents. This is a period of tremendous variability among youngsters of the same age. With young adolescents the achievement of academic success is dependent on other needs being met (Manning, 2002a). When viewing the entire stage of development known as young adolescence, there are five common areas of change that surface. The most marked areas of change observed in these children are intellectually, morally, physically, emotionally, and socially.

Intellectual Development

Young adolescents display a wide range of intellectual development during the middle school years. They are able to constructively manage multiple transitions in body, thought, emotion, and social relationships (Roeser et al., 2000). They move from concrete thinking to abstract thinking. Young adolescents are extremely curious and have a wide range of intellectual interests many of which are not pursued. Middle level children prefer active over passive means of learning and peer interaction during the learning process. This indicates that participation in real life situations is most effective and motivational. They are in the process of better understanding their own capabilities and will be inquisitive about adult situations. Young adolescents will challenge authority sometimes to observe reaction. They are interested in the world around them, which may have the appearance of lack of interest in standard subjects. It is during this

period that middle school students develop senses of humor and some will try this out on trusted adults (Manning, 2002a). They can grasp complicated ideas classify, generalize, rationalize, and defend opinions. They are diverse, engaged in self-exploration, definition, and eager to participate (Finks, 2002). They have the ability to reason, make moral choices, think abstractly, and conceive of more than one single idea at a time. Although young adolescents are capable of abstract thinking, they must have a systematic approach to creative thinking and problem solving. Because their cognitive growth is gradual, middle-aged children need concrete experimental learning in order to develop (Manning, 2002b).

Moral Development

Middle school children are idealistic and wish to make the world a better place. Consequently they often misjudge the difficulties in making great social changes. They often think in terms of "what is in it for me?" They have a great compassion for those who are down trodden and very little for those who are not. While they are searching for new values they typically take on those of their parents. During these years, middle level children rely on their parents for difficult moral decisions. Yet, they have the beginnings of accessing issues in shades of gray. Young adolescents are quick to notice flaws in others but not themselves. They value exercises in democracy and focus on inequities in the system (Manning, 2002a).

Physical Development

Development during the middle school years is rapid, irregular, awkward, and uncomfortable often resulting in uncoordinated movements. Hormonal changes are

irregular and result in restlessness and fatigue. Because there is an increase in energy levels this group must have increased physical activity. Young adolescents develop sexual awareness and secondary sex characteristics begin to appear. There are physiological changes associated with development of reproductive systems (Manning, 2002a). Middle school children have the capacity to reproduce initiated by the onset of puberty (Long, 1993). While they need good nutrition and understand this, they prefer junk foods. This can result in poor physical condition and muscle tone, and often leads to physical vulnerability. There are surges in physical growth, body fat, weight, height, muscle mass, and bone structure. Girls mature one to one and a half years earlier than boys which affects self-perception (Manning, 2002a). Young adolescents display uneven physical development, which is referred to as asynchronicity in physical development of young adolescent boys (Finks, 2002). This unbalanced growth results in poor coordination and awkwardness (Campbell, 1991). Early adolescents become preoccupied with self image and spend large amounts of time in front of a mirror during this developmental stage. With all of this rapid growth comes easy fatigue, which adversely effects learning and attention spans (Manning, 2002a).

Emotional Development

Middle school children typically experience intense, unpredictable mood swings. The need to release energy often results in outbursts of activity. Early adolescents seek to become independent yet seek adult acceptance. They are self-conscious, lack self-esteem, are highly sensitive to personal criticism and are intensely concerned about peer acceptance. Most middle level children are preoccupied with themselves and long for

approval to avoid discouragement (Manning, 2002a). Young adolescents constantly feel as though they are the center of attention, surrounded by an imaginary audience that notices and passes judgment on everything they do. They tell stories to themselves about themselves to overcome low self-esteem (Long, 1993). Young adolescents become increasingly concerned about their physical changes and appearance and experiment in sexual behaviors to relieve pressures or gain acceptance. They often believe that their experiences are unique. This all creates a psychologically vulnerable individual due to the overwhelming number of changes (NMSA, This we Believe, 1995). This vulnerability is caused by their inability to put events into perspective. Sex role identification becomes increasingly difficult during young adolescence, especially among boys who are vying for masculine dominance. An exaggerated sense of fairness exists in young adolescents. They are quick to point out inequities in adult behavior but often fail to see it in their own behavior (Campbell, 1991).

Social Development

Middle school adolescents have an intense need to belong to a group who approves of them. They often copy behaviors of other, older, and approved of individuals. This can have the reverse effect of appearing immature. Adolescents seek freedom from adults and often model peer behaviors. They have a consuming desire to define themselves and to belong to an accepting group (Manning, 2002a). In this endeavor they may experiment with new language, slang, fads and strange behaviors. They feel pressure to be accepted by early maturing girls and athletically successful boys. Young adolescents often over-react to criticism, embarrassment, and rejection.

This can result in social vulnerability (NMSA, This we believe, 1995). Peers often replace parents as the greatest influence but these children still seek positive relationships with peers and adults. Friends are a preoccupation for young adolescents. Girls prefer intimate friend relationships and boys prefer loyalty and undying support from friends. In both sexes, it is common to express friendship by hitting, pushing, tripping, and twisting arms. Because group membership is paramount, young adolescents become more aware of ethnic or cultural grouping and may have to make difficult group membership decisions during this period. (Campbell, 1991)

What the Young Adolescent Requires from the Learning Environment

The purpose of middle level schools is to promote young adolescents' intellectual development. The learning environment at this level must also promote creative thinking, problem solving, effective communication, social adaptation, and factual foundations. Above all else, middle grades schools must be about helping all students to learn to use their minds well (Jackson and Davis, 2000, pg 11). Effective middle level learning environments should adopt these principles:

Large middle schools should be divided into small learning communities.

Middle schools must teach a core of common knowledge.

Middle schools must be organized to ensure success for all students.

Middle schools must promote good physical health.

Middle school teachers and administrators must be experts in young adolescent learning and development.

> The community, school and parents must have a partnership in education. (Jackson and Davis, 2000)

The middle school learning environment must prepare students for high school and beyond. In this setting, the child must be the focal point as opposed to school programs (Finks, 1990). The learning environment must address the academic developmental needs of all students. Middle school students need an environment that is joyful and where their learning styles are valued and celebrated. In support of this, they must be promoted as scholars, democratic citizens, and self-sufficient individuals. They must be empowered to learn and must be engaged intellectually (TEA, 2004). The instruction for young adolescents must encourage mastery of course content and challenge students to be active learners. This is accomplished most effectively by connecting themes across subject areas. This supports the notion that intellectually, young adolescents need varied learning experiences (Long, 1993). This environment must also provide instruction and activities that develop higher order thinking and the skills needed to deal with the challenges of society (Manning, 2002b). Thought processes must be supported by a systematic approach to thinking and problem solving. This includes assistance in making correct choices yet must be accompanied by the allowance for mistakes and many opportunities for success (TEA, 2004). With this flexibility should come ample opportunities to explore choices with a sense of autonomy and the goal of achieving basic outcomes (Anderman and Midgley, 1997).

Student achievement of basic outcomes must be recognized regularly (Long, 1993). Student work should be displayed and celebrated in common spaces (Finks,

1990). Additionally, the learning environment must enable students to develop their abilities, learn to love learning, find facts, weigh evidence, draw conclusions, determine values, and think with an open mind. This mandates plenty of open space for students to experiment and the chance to have a say in the activities that they participate in (Long, 1993). The learning environment must also provide additional support structures beyond academics (Roeser et al., 2000).

Young adolescents need a social and cultural component to their learning environment. Instruction in this area must have physical ability and awareness, self-esteem, and cultural awareness components. The learning environment must improve social relationships with peers and the opposite sex (Manning, 2000b). Middle level children need a sense of relatedness to their peers and a sense of competence in their presence (TEA, 2004). They must be allowed to discuss ideas with teams of peers and be allowed to rehearse activities with peers. This necessitates classroom arrangements that promote learning groups and student-to-student communication (Manning, 2002b). During these processes early adolescents must be allowed to take social risks, initiatives, and build relationships with other middle school children. They need to be included in group and team activities where collaboration is encouraged (Finks, 1990). This will allow the opportunity to make meaningful contributions to their peer groups and community. As part of this social connection, middle school adolescents need relationships with adults who will act as role models. These role models will, at times, need to express adult-imposed protection from a peer group (Long, 1993).

In a physical sense, young adolescents must feel safe, secure and cared for in their school building. It must be considered a home base and a place of protection. Therefore, the physical environment must be clean, well maintained, bright and cheerful. This includes the space required to expend energy on frequent basis (Finks, 1990). Young adolescents need lots of physical activity without intense competition (Long, 1993). As part of school programming there must be time set aside for frequent physical fitness activities (TEA, 2004). In addition, young adolescents need ample space and time to decompress, self-reflect and self-evaluate (Long, 1993).

Young adolescents identify several common traits for teachers of effective learning environments. Respect from teachers and respect for teachers is the number one trait that middle school children identify. Teachers must earn respect, model respectful behavior, give clear messages, and enjoy their students. Teachers in effective learning environments must be fair. These teachers listen to perceptions, concerns, and interpretations and are willing to negotiate are the most effective. Teachers who conduct their business safely, orderly, and consistently are highly valued. Trustworthy behavior in teachers is also crucial. This includes maturity, sensitivity, reliability, and discreetness. The most frequently used adjective in describing an effective teacher was the word "fun". This mandates a sense of humor and the ability to effectively break up tension (Jackson and Davis, 2000). In sum, successful middle schools must have a positive learning environment with "as much of consideration for who the student is and becomes-his and her self-concept, self-responsibility, attitudes toward school and personal happiness-as for how much and what he or she knows!" (Finks, 1990, pg. 7).

The Learning Environment Impacted by Educational Facilities

The learning environment has evolved greatly over the past two hundred years. The earliest American school was initially intended to protect the occupants from the elements. The impact of these early facilities on the learning environment was rarely considered and often misunderstood. As the quantity and quality of our facilities increased, pioneers in education such as Dewey and Mann altered the systems for facility planning and construction. They understood the importance of an environment that was conducive to learning and led the nation towards more effective education. It was through their efforts that we have the contemporary focus on the learning environment and the creation of facilities to support this environment.

In order to understand the impact that middle school facilities have on the middle school child the research painted a clear picture of who this customer is. Young adolescents have very distinct developmental characteristics that mandate responsive facilities. Their learning environment requirements are recognizable, identifiable, and can be impacted by the facilities where children learn. The preceding sections have described the history of educational facilities and learning environments and the customer who is impacted by them.

This section will first review current educational facilities construction trends and priorities. It will then define the learning environment with the foundation of historical fact and customer requirements. This portion will present and describe factors such as the physical and instructional environment and spatial impacts. Finally, the

variety of impacts that educational facilities have on the middle level learning environment will be reviewed.

Current Educational Building Trends

In a recent report by Paul Abramson (2005), national educational facilities construction trends were observed and described. A clear discrepancy is quickly visible. In 2004, the nations school districts spent five billion dollars on new high schools, 4.6 billion on new elementary schools and a mere 2.5 billion on new middle school construction. This equates to 39.3% of 2004 dollars going to the construction of new elementary schools, 38.7% to high schools, and 20.3% to middle schools. While the trend in school size is downward in elementary and high schools, middle schools continue to remain about the same size.

In the area of renovation, ambient upgrades are the priority. Fifty percent of renovations focus on heating, ventilation and air conditioning (HVAC) and electrical upgrades. Forty percent of renovation spending was on upgrades to flooring materials, 44% to lighting upgrades, and 37% to plumbing improvement. Other areas of renovation were ADA compliance, restroom improvement, roofing, building code compliance, and upgrading windows. Districts across the nation renovate all grade levels evenly.

In the Texas region, which includes Arkansas, Louisiana, and Oklahoma, 2.4 billion dollars were spent on construction with 70% being spent on new buildings. 1.6 billion dollars is spent on new buildings with 50%, or 8 hundred million spent on elementary schools alone. This makes this region the second highest spending region in

the nation. This leaves little funding for renovation and maintenance of facilities. It is predicted that this short fall will be a detriment to districts in the near future. With 50% of new construction money going towards elementary schools, the discrepancy above becomes more evident. Districts are not considering the most important and influential section in the middle a priority when it comes to facilities construction and upgrade (Abramson, 2005).

The Learning Environment Defined

It was understood in the 1930's and 40's at the Educational Facilities Laboratories in New York city that correct surroundings could significantly impact the environment in which children learn. "The school house, it was said, must be designed to provide opportunities for every youngster to develop all that is in him in body, mind and spirit." (Cutler, 1989, pg. 13). John Dewey believed that the learning environment was a humane place that is attentive to individual needs rather than those of the masses. The learning environment must support learning. Learning was and is considered an understanding or ability to construct knowledge in meaningful ways for a practical purpose or solution to a problem. The physical learning environment should not be constructed to influence teaching or learning styles but should be responsive to individual student and teacher needs (Lang, 2005). This physical learning environment is created by the sum total of the factors affecting our perception of the facility that we occupy (Hawkins and Lilley, 1998). These physical surroundings in the learning environment impact perceptual learning, concept formation, language development,

socialization, creative growth, attitudes towards school, reduction of vandalism, and attrition rates in schools (Lackney, 1999b).

The physical learning environment is formed by the relationship between the architectural facility and the surrounding environment (Loughlin and Suina, 1982). Two primary components make up the sum total of the surrounding environment, the natural and man made environments. Because most student activity and teaching take place in the man made environment, this discussion will focus on the characteristics of that environment (Lowe, 1990). Commonalities in the man made, physical learning environment, simply the learning environment henceforth, are clearly iterated in the literature. The learning environment is made up of the physical surroundings present in a learning situation (Barker and Garvin-Doxas, 2004). These ambient factors are created by the commonly identified features of lighting quality, indoor air quality (IAQ), noise management, and size (Lackney, 1999a Lang, 2005 Chan, 1996 Black, 2001). Several additional physical features are integral to the learning environment. Chan (1996) suggests that the aesthetic qualities in a building are part of the learning environment. Lang (2005) describes the components of these aesthetic qualities. Lewis (1995), Earthman (2002), and Chan (1996) emphatically present the factor of facility condition as a component of the learning environment. Heath and Mendell (2002), Lackney (1999a), and Lyons (2002) stress the criticality of indoor air quality (IAQ) as a key component of the learning environment. The very center or focal point of the learning environment is the classroom. It may be said that this is the physical embodiment of the learning environment. It is the point of delivery in the learning and teaching processes

(Black, 2001). All of the aforementioned physical components come into play in the classroom and define a learning environment.

Ambient Factors

Lighting: Schools in the pre-electric periods were built with as many windows as possible because natural lighting was the most efficient and readily available method for illuminating the learning environment (McCreey and Hill, 2005). As schools became air-conditioned in the 1950's, windows began to disappear from school design. At the same time, the movement towards open concept schools all but eliminated the need for natural lighting (Kennedy, 1999). As energy costs have increased since this time, the production of energy efficient lighting has grown. Incandescent lighting has been replaced by fluorescent lighting as the most common form of artificial lighting (Lang, 2005). Evolving from cool white florescent lighting in recent years, full spectrum lighting is now becoming popular, although controversial, in school design and construction (Lackney, 1999a).

The impact of lighting, sometimes referred to as illumination, is well studied and documented. Much of the question surrounding lighting involves the best type of lighting or a balance in three commonly used light sources (Lang, 2005). Students must have appropriate lighting in order to learn and thrive in their learning environment. Schnieder (2002) cites seventeen studies from the 1930's to 1997 concerning lighting. The conclusion of these studies was that appropriate lighting improves test scores, reduces poor behavior, and plays an important role in student achievement. At a more basic level, lighting has dramatic biological effects on humans. Physiological factors

impacted by inappropriate lighting are visual acuity, glandular and metabolic activity and biological rhythms. Emotionally, lighting can affect depression levels and mood swings (Lackney, 1999b). As a matter of health, natural lighting can affect the natural production of vitamin D, which influences the development of strong bones and healthy teeth (Lyonns, 2002). Inappropriate lighting can cause eyestrain, blurry vision, and headaches. These distracters naturally affect a student's ability to mentally concentrate on learning tasks (Lackney and James, 1999c). They can also lead to confusion, slow reaction, increased stress, and poor visual processing (Chan, 1998). A study by Kleiber (1973) found that when exposed to full spectrum, cool white fluorescent, and natural lighting, most students were less fatigued after study sessions in naturally lighted spaces (Lackney and James, 1999). A study by the Heschong Mahone Group (1999), which studied 2,000 classrooms, indicated that students exposed to the most natural day light progressed 20 percent faster in one year in math, and 26 percent faster in reading (Schneider, 2002). Classrooms with well-designed natural sky-lighting had students progressing from 19-20 percent faster in math and reading than students without natural lighting in a study conducted in Capistrano California. Natural lighting was shown to improve visibility, light quality, health, and mood in teachers and students in the same study (Kennedy, 1999). Obviously though, sole reliance on natural lighting cannot be accomplished, there must be a balance.

"The human need and desire for natural sunlight and for views to adjacent spaces requires that two illumination sources be balanced for a variety of activities." (Lang, 2005 pg. 3). There must be a balanced combination of natural and artificial lighting.

When comparing full spectrum fluorescent, cool white fluorescent and natural light, a balance among these three can improve student behavior (Lackney and James, 1999). If not balanced, glare and reflectivity, major causes of distraction, will be heightened (Lang, 2005). The way we light our learning environments is one of the most important factors in learning. It affects mental attitude, class attendance, and performance (Lyons, 2002).

Indoor Air Quality (IAQ)

Temperature**:** Indoor air quality is dependent upon the interaction of air temperature, humidity, air pollutants, and ventilation. Temperature is the most influential of these factors. Specific studies on the impact of thermal quality on the learning environment have been occurring for several decades. A study by McGuffy in 1982 was one of the first to recognize the impact of heating and air conditioning on the learning environment (Schneider, 2002). The foundation for this later work was laid 61 years ago by the New York Commission of Ventilation (1931). The Commission sought to determine the best classroom temperatures for the healthiest learning environment for students. This study tested city, rural, and experimental classrooms. "Students were subjected to varying temperatures while in the classroom and measures of the number of reported illnesses were taken to compare with the temperatures." (Earthman, 2002, pg. 4). The report concluded that temperature in the classroom must be maintained within a narrow band between 67 to 73 degrees Fahrenheit to reduce illness (Earthman, 2002). There is now general acceptance of the fact that a proper classroom environment must include climate control (Hawkins and Lilley, 1998).

Students typically like temperatures slightly cooler than adults by 5 to 10 degrees. Male clothing insulates children's bodies better than contemporary female clothing. Temperatures in the enclosed spaces of a school depend on several physical factors. The configuration and materials of the building, amount of glazed surfaces, size and volume of space, number of occupants, activity level of occupants, cooling/heating system quality, and control flexibility all contribute to the thermal quality in the learning environment. If, for example, a teacher must open or close windows or doors to control temperature as opposed to independent electronic control, the system efficiency will be minimized as well as teacher effectiveness (Lang, 2002). Deficient design contributes to problems in thermal quality as well. Many of these systems are outdated, over-utilized or inadequate for the area required to condition (Lyons, 2002). "It is not feasible however, to provide every student in a common space with the temperature that best suits him or her." (Schneider, 2002, pg. 5). Therefore, the best temperature range for the learning environment is 68 degrees to 74 degrees (Schneider, 2002) (Earthman, 2002) (Boggio, 2004). The ability to control the temperature within this range is critical to the performance of teachers and students (Boggio, 2004).

Distraction caused by thermal discomfort can impact children at the most basic level. This type of distress can cause the cerebellum to limit the brain's cognitive operations (Chan, 1998). Specifically, temperatures above 74 degrees produce harmful physiological effects which decrease work efficiency and output. Reading and math skills are adversely affected by higher temperatures (Lackney and James, 1999c), (Schneider, 2002). As temperature increases, students report greater discomfort and

inability to concentrate on tasks (Schneider, 2002). Effects of high temperature discovered in the 1931 Commission report are germane even today. As much as 15% less physical work is accomplished at 75 degrees and 28% less at 86 degrees when compared to work accomplished in 68 degree temperature. Poor thermal quality affects teaching ability as well. Scheider (2002) cites the Herschong Mahoney Group results from 1999. This report showed that temperature control was an important issue for teachers. The best teachers in the country were queried and they all emphasized that the ability to control temperature in their classroom was critical to their professional performance.

Ventilation, Humidity, Pollutants**:** While air temperature is a very tangible factor in air quality, ventilation, humidity, and pollutants are less so (Lyons, 2002). The interaction between temperature and these three factors can have a great impact on the learning environment. The General Accounting Office has found that 15,000 schools suffer from poor IAQ. This affects as many as 8 million children or one in five American students. This is due primarily to power saving construction measures implemented in the 1970's. During this time many schools were built with air handling systems that delivered less fresh air than is now considered adequate. The Occupational Safety and Health Administration (OSHA) recommends between 15 and 20 cubic feet of air per minute per person. These increased ventilation rates deliver more fresh air and dilute or remove indoor air pollutants (Schneider, 2002). School buildings have 4 to 5 times as many occupants per square foot as do office buildings (Kowalski, 2002). To compound this challenge children are considered the most vulnerable to environmental

contaminants because they have higher breathing and metabolic rates than adults. They also have less robust biological defense systems (Lyons, 2002).

Humidity control is critical in relationship to temperature and ventilation. Ventilation removes and replenishes air, effects temperature levels, and changes humidity levels. Most significantly, if humidity is too high it can promote the growth of bacteria, mold, and mildew. Humidity levels greater than 72% creates visible mold growth and complaints of allergy symptoms. Moderate humidity, between 40 and 70 percent combined with temperatures between 68 and 74 degrees promotes higher mental functioning in children (Schneider, 2002). Additionally, these conditions reduce asthmatic symptoms in children. This disease affects as many as 4.8 million children per year in the United States. Reducing the asthma and its contributing environment can reduce student drowsiness, inability to concentrate, and lethargy. If schools reduce unhealthy environments, sickness is reduced and teacher and student productivity is increased (Schneider, 2003).

School buildings can also be very susceptible to indoor air pollutants. Concentrations of indoor air pollutants can be two to five times greater indoors than outside according to the Environmental Protection Agency (EPA). Biological agents are a large part of the pollution in a building. Bacteria, mold, parasites, viruses and other agents can thrive if ventilation is inadequate (Kowalski, 2002). The effects of these agents on children in the classroom reduce learning and physical health (Lackney, 1999b). School buildings are also full of non-biological agents inherent to building construction and scientific classes. Asbestos fibers, dust particles, fiberglass, gas

emissions, sewer gas, pesticides, formaldehyde, chalk dust, and fire proofing are some of the indoor pollutants affecting children in school buildings. Adequate and improved ventilation systems can diminish and remove these pollutants. In order to reach this level of effectiveness, regular, systematic audits of school air quality must occur (Kowalski, 2002). The methods for improving indoor air quality such as increasing fresh air intake and increased ventilation rates are proven to reduce indoor air pollutants, optimize humidity, and improve general air quality. These air qualities all have a direct impact on student learning and the learning environment (Lackney, 1999b), (Heath and Mendell, 2002).

Acoustics

Acoustics in the classroom clearly impacts the learning environment. Schneider (2002) cites a GAO study that reported poor acoustics as their most serious environmental concern in schools. In this study, elementary and secondary classrooms were studied and found to have severe impediments caused by excessive background noise. Lyons (2002) identifies three sources of noise in the learning environment. These sources are noise from outdoors, mechanical noise generated between rooms or corridors, and noise from within the classroom including ventilation systems. Noise reduction and control in the classroom is an important consideration in the design of schools (Schneider, 2002). These noises, or acoustical liveliness, are a product of many design flaws in school buildings. Surface finishes, material density, and air tightness all contribute to acoustical effectiveness. School designers and educators must take into consideration how rooms will be used. If group work is more prevalent than

unidirectional lecture, room materials must be more absorptive. Hard walls made of glass or marker boards should not oppose one another. Echoes and reverberations can be effectively managed by angling walls five degrees out of the parallel plane. Carpet on floors and acoustical ceiling tiles drastically reduce noise bounce. Heavy walls or walls with sound insulation reflect echoes as well (Lang, 2005).

Basic guidelines have been set for optimal acoustics in schools. The Architecture and Transportation Barriers Compliance board and the Acoustical Society of America have set limits for background noise at 35 decibels in schools (Schneider, 2002). This was influenced by studies in noise pollution as far back as 1917. Studies at this time found that 40 decibels was optimal for math and reading performance (Earthman, 2002). Most HVAC and ventilation systems exceed this limit presently (Schneider, 2002). The location of school buildings is also a critical factor in acoustical management. Student achievement is significantly correlated to disruptive noises both internal and external. The location of the learning environment is critical to minimizing these distracting factors (O'Neill, 1999). Earthman (2002) cites findings from a 1975 study in New York City and California. In this study, the learning environments of schools were observed near railroad tracks and in schools that had a noisy side of the building. In these experiments, noise abatement measures were installed in the buildings and rubber pads placed on the train tracks. These measures effectively reduced extraneous noise levels for students.

In these studies, students on the noisy side of the buildings performed lower on California Achievement Test scores than those students on the less noisy sides of

schools. The noise abatement procedures equalized those scores (Earthman, 2002). Children require higher acoustical quality than adults to attain good speech acquisition for maximum comprehension. In a study by Gary and Maxwell (1999), students who had to continually learn in an environment with external noise scored 20 percent lower on word recognition tests than those in quiet learning environments (Lyons, 2002). Schneider (2002) found that excessive noise in school increased student dissatisfaction and stress levels. Other studies have linked high levels of classroom noise to poor reading and spelling ability, poor behavior, reduced attention and concentration spans, and lowered academic performance. This has been found to induce feelings of helplessness in children and an inability to apply learning tasks. At a physiological level, exposure to excessive noise in a learning environment causes increased blood pressure in children. It was also found that children's blood pressure did not decrease during prolonged exposure to noise in the classroom. This indicated that children do not get used to noise pollution in the learning environment (Boggio, 2004) (Lackney, 1999b) (Schneider, 2002). Whether the learning environment is a classroom, auditorium, or music hall, these areas will be most effective for learning and teaching if sound is controlled (Hawkins, 1996). The ability to clearly understand verbal instructions is a pre-requisite for effective learning. If this ability is degraded by noise pollution in the learning environment, children will not perform well (Earthman, 2002).

School Size

The question of school size has been debated since the 1890's. From this time through the 1930's there was a movement towards consolidation of many small schools

and districts (Lyons, 2002). This was a nationwide process and during this period, small schools were considered a thing of the past. Many constituents of school districts believed that bigger was better. High schools with several dozen students were combined to form schools with hundreds and in many cases, thousands of students. The replacement of one-room schoolhouses began in earnest at this time (Brubaker, 1998). The United States experienced a 70% increase in student enrollment between 1940 and 1990. During this time period, the total number of schools has declined from 200,000 to 62,000. In 1940 there were 117,108 school districts and by 1990 there were 15,367. This massive consolidation process has increased average campus enrollment by 514% (Boggio, 2004). Today, it is not uncommon to find high schools with 2,000 to 5,000 students (Lyons, 2002). In addition to the obvious economic advantage in larger schools, there is a programmatic advantage. It was believed until recently that large schools could offer more extensive curriculum and a greater variety of programs (Boggio, 2004). Large schools also make specialized facilities available for some non-core curricula. Physical Education, theater arts, athletics, music, and technology courses all benefit from large scale schools. In many states, size means power. Americans favor large pools of athletes for football, basketball, and baseball (Brubaker, 1998). However, mounting, irrefutable evidence suggests smaller schools are more effective learning environments.

"One can make a case for either small or large school districts. I do think, however, more and more people who attended small schools, if surveyed, would prefer to repeat their experiences as opposed to people who attended large schools." (Kowalski,

2002, pg. 10). In a study by Chandler (1993), parent perceptions of their children's' learning environments decreased as the school size increased. Positive perception scores dropped from 80 in schools of 300 to 75 in schools of 1,000. While evidence supports smaller schools, the definition is debated to this day. The consensus does suggest that elementary schools of 300 to 400 and secondary schools of fewer than 1,000 maximize the benefits of small size (Schneider, 2002). The evidence in support of smaller schools is extensive. Boggio (2004), Brubaker (1998), Chandler (1993), Earthman (2002), Hawkins and Lilley (1998), Lackney (1999b), Lyons (2005), and Schneider (2002) all agree that children learn more and better in smaller learning environments. In smaller schools they found higher attendance rates, greater participation in extracurricular activities, and reduced negative behavior. Graduation rates are consistently higher and dropout rates lower in smaller schools. Students have a better self-image and are more satisfied with their school when it is smaller. Lackney and James (1999c) cite several studies where math scores were 15% higher for children in smaller learning environments. Performance gains in these children were 11-34% higher than for children in overcrowded schools. Lackney and James (1999c) cite studies in California that found lower crime rates in smaller schools and less serious student misbehavior. Earthman (2002) found that reading scores were 4 to 9 percentage points lower for children in overcrowded schools. For sixth graders taking a math achievement test, scores were 2 to 6 percentage points lower in overcrowded schools. Boggio (2004) concluded that as the size of schools increase, student achievement decreases.

Teachers also note a difference in overcrowded schools. When the capacity of the school is exceeded, extreme pressure is placed on teachers and administrators (Earthman, 2002). He also found a higher rate of teacher absenteeism in crowded schools and a more pervasive unhappy attitude. Teacher attitudes were significantly better in smaller schools. There are higher levels of cooperation and better teacher efficacy in smaller settings (Schneider, 2003). Faculty members are more aware and involved in school activities in smaller schools. Additionally, because the environment is more intimate, teachers recognize and know students better. In this type of learning environment, teachers hold students more accountable, form closer relationships with students, and have closer ties to parents (Boggio, 2004). Parents report a better sense of belonging and community in smaller learning environments. Smaller schools also encouraged parental involvement and generated greater satisfaction. Most importantly, when the customer is considered, reducing class and school size improves student achievement reduces discipline problems and provides the greatest benefits to students and parents (Earthman, 2002).

Aesthetic Qualities

The aesthetic qualities such as building age, condition, color scheme and, to a lesser degree, material finish, impact the learning environment as well. Building age and condition are closely connected and have a great impact on the learning environment.

Building Age and Condition: The condition of schools is directly linked to the age of educational facilities. In 1999 public schools in America were built 40 years ago on average. The functional age of a school is determined by the number of years since

construction and renovation has occurred. Six out of ten schools had a functional age of fewer than 15 years by this measurement. The relationship between age and condition is straightforward. Older schools are in the poorest condition. Older schools also typically have more inadequate learning spaces than newer schools. Nationally, on average, a majority of schools were adequate in condition and functionally young at the time of the study. However, there are a substantial number of schools that are in poor condition and suffer from the effects of age (National Center for Educational Statistics, 2000). It was found that older buildings simply do not have the main attributes of more modern buildings that are conducive to an effective learning environment (Earthman, 2002).

Lewis (2000) found a statistically significant relationship between school condition and student achievement scores. In a study in Milwaukee that measured 139 schools, eleven academic relationships between school condition and student achievement were discovered. Facilities with an increased condition score reflected a 1.6 point increase on math scores. Similar increases were found in science, reading, and social studies. These findings indicated "facility condition may impact student performance more than social and economic variables." (Lewis, 2000, pg. 2). In a similar study by Stevenson (2001) in North Carolina, school age had significant effects on middle school pre-ACT performance. The schools in this test were on average 37 years old. When teachers and administrators were asked whether the condition of the school impacted the learning environment, 67% stated that the condition of the facility significantly impacted school achievement. Subject areas most susceptible to building condition due to age were science, math, English and social studies. Chan (1996) cites

seven studies between 1962 and 1979 that found significant relationships between school age and student achievement. Five of these studies were conducted with young adolescents in secondary schools. An almost identical study by Heath and Mendell (2002) found corresponding results. O'Neill (1999) found that building age had the strongest relationship with student achievement when compared to areas such as learning space and exterior environments. His study was conducted at middle schools in central Texas. Lackney and James (1999c) and Yeilding (1993) found that improved facilities can increase standardized test scores from 5.5 to 11%, further linking building condition to an environment conducive to learning.

In non-academic areas of the learning environment, building age and condition had similar impacts. Building condition is found to affect student time on task, student cooperation, classroom interruption and behavior (Lackney,1999b). Boggio (2004), Earthman (2002) all found that disciplinary problems decrease as school age decreases. As building conditions improve, so do student behaviors improve. "School facilities have a direct effect on teaching and learning." (Schneider, 2003, pg. 4). The condition of a school building also influences the effectiveness of teachers. Teachers in buildings that are in poor condition state that it has a negative impact upon the learning environment (Earthman, 2002). Improved facilities even influence teachers to continue teaching (Lackney and James, 1999c). School condition and age have such a huge impact on the learning environment that educators and facilities planners cannot ignore them. Yet, additional aesthetic impacts on the learning environment exist.

Color: The use and importance of color schemes in the learning environment has been examined in several studies and has a significant impact on the learning environment (Chan, 1996). School coloring creates more controversy than any other surface treatment or material used in educational facilities. Cultural style, historic and symbolic traditions are all evoked by the color used in the learning environment (Lang, 2005). Color selection is complicated by the variety of users in a learning environment. Functional color provides an advantage over personal preference in color selection. Warm colors draw emotional and visual interest outward in children. Cool colors have an opposite affect. They are best for secondary grades, particularly in study areas were individual tasks are utilized. Cool colors accomplish this by directing students' attention inward. Learning environments should typically strive for natural finishes on all surfaces with a moderate level of reflectance (Brubaker, 1998). Successful color schemes have also been found to reduce absenteeism and increase positive attitudes about schools (Boggio, 2004). Pastels have been found to be associated with effective learning environments. Greens and blues are the most peaceful colors while reds and oranges stimulate action in children (Chan, 1996). Much of the influence that painted surfaces have relates to school age. The perception of newness or good condition, as seen earlier, affects learning in a positive way.

The Classroom

"The core facility of the learning environment should be the so-called classroom." (Gardner, 2005, pg. 44). It is the setting where children spend a large amount of their time and where most experience learning. The modern classroom must

be responsive to multiple delivery methods and varied ways of learning. It must be flexible and adaptable to accommodate multiple learning styles (Lang, 2005), (Kennedy, 1999). The "egg crate" classroom arrangement of 200 years ago should be succeeded by a place of discovery, wonder and creativity (Aldrich, Taylor, and Vlastos, 1997).

There have been predictions for decades that the classroom as we know it will disappear. Yet, efforts to change it, reshape it, cluster it, and re-configure it have been marginally successful. Even in the most modern building plans today the 25-30-student classroom still exists. It is typically rectangle or square, some have windows and all have entryways. Some entryways are sealable with a door to keep outside distracters at a minimum. Much of the arrangement, style, and size of classrooms in relationship to each other were directly influenced by the advent of air conditioning in the 1950's. Certain design characteristics of air handling and ventilation systems restrict variation to large building footprints, wide and long floor plans, and modular design. There are many variations within these parameters that are influenced by the restriction of HVAC. The most prevalent relationship is the gridiron plan where windowless classrooms are organized into a grid pattern. While this style of classroom organization is the most common, it can also be the most oppressive if reproduced repeatedly. On the far end of the spectrum is the organic classroom plan. It is a rambling design with different sized rooms, materials, finishing, and detailing. A very progressive, cutting-edge trend in classroom orientation is the school-within-a-school or house plan. Classrooms are designated by subject and students are part of a family with the houses of the school (Brubaker, 1998).

Within the classroom environment, the space should resemble an inter-active library. Within the room there should be individual learning alcoves, tables, and personal space. Lackney (1999a) describes these small areas as "resource-rich" activity pockets. This sense of personal control reduces stress, encourages cooperation, and increases a feeling of security in young adolescents. Classrooms should be accessible to the outdoors as seen in the groundbreaking Crow Island School of 1940. The rooms should cluster around a common area, typical of the house plan. This provides a sense of unity and cohesiveness so important to the customer. The ideal rooms should also be flexible enough to provide both large and small areas for learning. Colors, textures and materials must be aesthetically pleasing which increases children's sense of personal value and importance (Black, 2001) (Lackney, 1999a). "Every object, color, texture, and spatial configuration as well as their selection and placement has educational significance." (Aldrich et al., 1997, pg. 2). The shape of the classroom spaces and furniture arrangements are physical clues that the environment is, or is not, conducive to learning.

The old vision of straight rows of desks facing a teacher's desk suggests teacher-centered instruction. Classrooms where students have their own workspace and flexible areas for cooperative learning suggest student-centered learning environments (Sanoff, 2000). Flexible sizing can be accomplished by moveable walls. This will allow for the transformation of the rectangular room into one with small alcoves. Again, this ability to influence ones own learning environment is empowering for children thus building confidence (Lang, 2005). The most successful learning environment for all grades, k-12,

provides a series of zones supporting individual learning styles. These include an entry zone, storage zone, display zone, living things zone, library zone, lounge zone, and technology zone. The physical structure of the facility should support this classroom design (Aldrich et al., 1997). This allows for multiple activities ranging from projects to presentations, tutoring or team activities (Abramson, 2004). Valiant (1996) refers to this flexible concept in classroom design as a "Learning Studio".

At a physiological level, flexible room design as suggested above, allows for growth of mental functions. The cerebellum, corpus callosum, and brain to neuron development are all strengthened by the ability to move around the classroom, influence the spatial arrangement, and vary activities (Chan, 1998). Spatial organization in a classroom has many other subtle impacts. Loughlin and Suina (1982) describe an environment-behavior relationship. Spatial messages cause children to move in certain ways unconsciously. Children may have to move in directions that cause conflict or cooperation, depending on the space provided. Unexpected behaviors may result which cause tension for the teacher and consequences for the child. The spatial organization can either facilitate learning or conflict with the purpose of the classroom. Often times, problem behaviors are directly associated with children's choices. However, the arranged environment in the classroom can encourage children to act certain ways that counter teacher expectations. When spatially arranging a classroom, the first concern should be to provide spaces for student activity. This will require careful planning and the need to observe the learning environment from a young adolescent's view (Loughlin and Suina, 1982). Lowe (1990) cites John Holt (1975) in regards to the impact of

classroom space: "We would have a lot less worry in our schools about motivating children, finding ways to make good things happen, if we would just provide more spaces in which good things could happen." (Lowe, 1990, pg. 30).

Flexibility and mobility are critical points in creating effective learning environments. Because a majority of any classroom is filled with furniture, selection requires consideration of its use, functionality, flexibility, support of varied learning styles and current teaching methods (Bingler, Quinn, and Sullivan, 2003). For Middle School children in particular, furniture must be mobile for children their size, coordination and activity level. Young adolescents like and demand frequent change. Providing furniture to support this customer will optimize the learning environment (Diehl, Parks, and Mauro, 1998). The classroom today must not just be a "regular" classroom. Unique learning styles must be facilitated and varying teaching methods must be supported by the classroom arrangement. It is the most important component in the learning environment. Students spend a majority of their time here (Lyons, 2002). The physical learning environment of the classroom can positively impact child learning, ideas, values, attitudes and culture. If thoughtfully planned, the learning environment will positively impact the learning process (Sanoff, 2000).

Summary

This review of literature has described the learning environment in schools from the birth of the United States to the present. In the very earliest days of very rudimentary education building design, people understood at a very basic level that these were learning environments and that they were impacted by the facility that housed

them. As educational philosophers and leaders such as John Dewey and Horace Mann increased awareness and research about the learning environment and the customers inside, educational facilities advanced rapidly. In a little over 200 years the country has gone from wooden shacks where twenty-odd children of all ages learned on a dirt floor to massive structures the size of malls where thousands of students communicate with the world. The impact of facilities on the learning environment has become all encompassing in a young adolescent's life.

But then, this is the customer, the young adolescent between the ages of 10 to 15. The thrust of the study will focus on the learning environment for this customer. They are in the most influential, dynamic and important developmental stage of their life. Their physical, psychological, emotional, and social needs must be seriously and scientifically considered as the very foundation for the learning environment in the form of a facility. Understanding the customer and his/her needs create a clear picture of the impact that educational facilities have on their learning environment.

It is the learning environment, the physical, man-made, arranged space that we create for our children that is the dependent variable in this study. It is also the dependent variable in the reality of day-to-day education of children. The learning and teaching environment depends on a well-designed educational facility. As presented in this review of literature, the impacts of the facility on the learning environment are numerous, varied, and extremely influential to the customer. Specific, focused research about the impact at the middle level is lacking. There is a gap between the literature and

what is known about the impact of educational facilities on the learning environment at the middle school level. This research will help to close that gap.

CHAPTER III

METHODOLOGY

Data Collection Process

This chapter describes the population of this study, the instrumentation employed the study design, presents the data collection process used, previews the data analysis process, and identifies assumptions and limitations of the study. This study will answer the following research questions:

1. What is the perceived educational adequacy and quality of Humble ISD middle level educational facilities and what is the impact of these facilities on the learning environment as reported by middle school teachers and administrators on the TLEA survey instrument?
2. What is the quality and educational adequacy of middle level educational facilities in Humble ISD as determined by the CEFPI Guide for Facility Appraisal Instrument for Middle School Appraisal (Hawkins and Lilley, 1998)?
3. What is the relationship between the perceived educational adequacy and quality of the HISD middle level facility's as reported by teachers and administrators on the TLEA and the perceived impact of these facilities on the learning environment as reported by teachers and administrators on the TLEA?
4. Is there congruency between the perceived adequacy and quality of middle school facilities as reported on the TLEA survey for educators and the quality and adequacy as assessed by the CEFPI instrument for architects?

Population

Human Subjects: The human subjects used to answer research question one consists of the teachers, administrators, and support staff, identified as the professional staff, in six middle schools in Humble Independent School District for the school year 2005-2006. This population of professional staff is 512. Tables 1 through 4 below describe the population by job description, gender, ethnicity, and years of experience. Table one depicts the total number of professional staff by campus, number, and percentage with N=512. Job description disaggregation shows that a majority of the population are teachers, support staff and administrators respectively. This is an important factor because each of these groups utilizes different areas over others and may perceive their physical space related to adequacy and quality differently.

Table 1 depicts the professional breakdown of campus personnel by number and percentage of the campus staff and faculty (TEA 2004).

Table 1: Population description: Professional breakdown by campus, number, and percentage

Campus	Prof. Staff	Teacher/%	Support St/%	Admin/%
AMS	97	84/81.0	8/7.4	6/5.3
CMS	77	66/84.0	7/8.3	4/5.0
HMS	95	81/76.0	7/6.6	6/5.6
KMS	72	62/77.0	7/8.0	4/5.0
RMS	77	66/81.0	7/8.6	4/5.0
TMS	94	79/77.0	9/8.7	5/4.8
TOTALS	N=512	438/86.0	45/9.0	29/5.0

(Note: AMS= Atascocita Middle School, CMS=Creekwood Middle School, HMS=Humble Middle School, KMS=Kingwood Middle School, RMS=Riverwood Middle School, TMS=Timberwood Middle School)

Table 2 displays the gender of the population in this study by campus, number and percentage. As can be seen in this table, females make up a majority of the population. This is significant due to the fact that females may view their physical surroundings in terms of adequacy and quality differently from their male counterparts.

Table 2: Population description: Gender by campus, number, and percentage

Campus	Male/%	Female/%
AMS	16/19.1	68/80.9
CMS	10/15.0	56/85.0
HMS	20/25.2	60/75.0
KMS	10/16.2	51/83.0
RMS	13/19.8	52/80.2
TMS	17/21.4	62/78.6
TOTALS	86/19.6	349/80.0

Table 3 represents the ethnicity of the population by campus, numbers, and percentages. As can be seen in this table, ethnicity is skewed towards white professional staff at the 76% level with 4% being Hispanic and 7% being African American.

Table 3: Population description: Ethnicity by campus, number, and percentage

Campus	Black/%	Hisp/%	White/%
AMS	5/5.9	3/4.6	75/90.0
CMS	2/3.0	0/0.0	64/97.0
HMS	10/12.7	4/5.0	67/82.4
KMS	2/3.2	4/6.5	56/90.3
RMS	1/1.5	4/6.1	61/92.4
TMS	11/13.8	2/2.5	67/83.7
TOTALS	31/7.0	17/4.0	390/76.0

Table 4 indicates the years of experience of teachers on each campus by years and percentage. This does not include the experience level of administrators or support staff. Teachers in the 1-5 year experience range make up the greatest percentage of the

population followed by 11-20 years, greater than 20 years, 6-10 years, and finally beginning teachers. Teachers having more than 6 years of experience make up an average of 60.7% of the population.

Table 4: Population description: Teaching experience by campus, years experience, and percentage

Campus	Beginning/%	1-5 yrs/%	6-10 yrs/%	11-20 yrs/%	>20 yrs/%
AMS	11.8/14.1	25.7/30.5	11.8/14.0	22.0/26.1	13.0/15.5
CMS	9.0/13.6	16.7/25.2	15.0/22.6	10.5/15.9	15.0/22.7
HMS	7.0/8.6	28.0/34.4	17.8/21.9	18.0/22.1	10.5/12.9
KMS	8.0/13.0	15.0/24.4	7.0/11.4	11.6/18.8	20.0/32.5
RMS	6.0/9.2	12.5/19.1	14.5/22.1	16.0/24.4	16.5/25.2
TMS	6.0/7.5	28.6/35.9	14.9/17.6	19.0/23.9	12.0/15.1
AVG	8.0/11.0	21.0/28.3	13.5/18.3	16.1/21.8	14.5/20.6

This population of 512 professional staff composed of teachers, administrators, and support staff teaches and supervises 6, 752 students on six campuses. The campus student populations are AMS-1,390, CMS-1,008, HMS-1,203, KMS-960, RMS-1,051, TMS-1,134. This equates to a student to teacher ratio in this population of 15.4:1. A majority of the subjects in this population are white, female, and teachers with an average of 12.1 years of teaching experience (TEA, 2004).

Non-Human Subjects: The population of non-human subjects used to answer research question two is a set of six middle schools in Humble Independent School District. This group of schools has many similar characteristics. All six buildings are single-story schools in a suburban setting which house grades 6-8. All of the buildings in this study are constructed of brick around a concrete frame on a graded slab. Each building is centrally cooled with energy sources of gas and electricity. Table 5 identifies

the year built, age, square footage and acreage of each of the six building subjects in this study.

Table 5: HISD middle school descriptions: Year constructed, age, square footage, and acreage

Campus	Year built	Age	Square Feet	Acreage
AMS	1983	22	139,022	19.2
CMS	1980	25	141,338	21.8
HMS	1993	12	151,310	22.8
KMS	1977	28	144,045	18.7
RMS	1991	14	139,022	24.8
TMS	1998	7	148,346	24
AVG		18	143,847	21.8

Instrumentation

This study will utilize two instruments to answer each research question. The first instrument used to answer research question one, the Total Learning Environment Assessment (TLEA) Middle School Version (see Appendix A), was developed and validated by David O'Neill (1999) for use in his dissertation. O, Neill sought to determine the impact of facilities on components of the learning environment such as student achievement, behavior, attendance, and teacher turnover rates in Central Texas middle schools as reported by educators at the elementary, middle and high school levels. O'Neill developed the TLEA from the CEFPI instrument under the tutelage of and with the permission of Dr. Hawkins. The TLEA is categorized into two sections that correspond to sections four and five on the CEFPI instrument: Educational Adequacy and Environment for Education. There are 82 questions about specific characteristics of an educational facility, which are assessed using two, four-point Lickert scores per question. One is an agreement scale that assesses the qualities of the building and the

other is a perception scale assessing the impact that each characteristic has on the educational adequacy of the learning environment. The agreement scale assigns points as follows: strongly disagree=1, disagree=2, agree=3, strongly agree=4. The maximum agreement score is 328 indicating the highest quality and adequacy possible for a given educational facility. The perception scale assigns points as follows: no impact=1, minimal impact=2, moderate impact=3, significant impact=4. The perception scale is not cumulative because it measures only the perception of the impact for one given characteristic of a facility. This additional response to each question was added with the permission of Dr. O'Neill via voice and email.

The TLEA is divided into two sections. The first section measures the Educational Adequacy of the middle school facility and consists of 47 questions. Questions 1-16 investigate the Academic Learning Spaces or those most commonly used by a majority of the students and teachers at the facility. Questions 17-31 investigate the Specialized Learning Spaces in the facility such as Science, Library, Gymnasium, Art, and Technology areas. Questions 32-41 assess the Support Spaces within the facility such as Cafeteria, Administrative, and Teacher office spaces. Questions 42-47 evaluate the quality and adequacy of the Community and Parent spaces in a facility.

The second section measures the quality and adequacy of the environment that exists for education and consists of 35 questions. In this section Questions 48-55 assess the quality and adequacy of the Exterior Environment of the campus. Questions 56-78 investigate the Interior Environment of the middle school facility. The final questions

79-82 determine the quality and adequacy of the Visual Reinforcers within the facility (O'Neill, 1999).

O'Neill (1999) established content validity for this instrument through a review of current literature in the field and through review panels consisting of College Professors and Facility Architects. In determining the validity of this instrument, the researcher interviewed Dr. Hawkins telephonically. No pre-testing or field-testing was conducted and this was not considered a research project. Dr. Hawkins and Lilley produced the instrument out of necessity for a widely useable and applicable instrument by architects. Educational facility architects and experts in the field who were considered the authority base at that time reviewed the instrument. Dr. Lee Burch, an educational facility architect conducted research with Dr. Zellner and Brown using the CEFPI instrument (Brown, Burch & Zellner, 2002). Dr. Burch indicated in an interview that their team established that content validity was reached through the repeated use and accepted validity by hundreds of experts in the field of educational facility design and construction over decades of application. Validity is defined by RA Zellner: "A measure is valid if it does what it is intended to do. Alternately stated, an indicator of some abstract concept is valid to the extent that it measures what it is purported to measure." (Keeves, 1988, pg. 322). Through the extensive use of this instrument over a period of seven years, content validity has been achieved. The appraisal process achieves appropriate reliability through the development of a team consensus for each item. Training and experience in appraisal of facilities has led to team consistencies within a 10% variance (Hawkins and Lilley, 1998).

Harold L. Hawkins, Ed. D., and H. Edward Lilly, Ph. D. developed the second instrument, the *Council of Educational Facility Planners International* (CEFPI) *Instrument for Middle School Appraisal* in 1998. The CEFPI Instrument for Middle School Appraisal was used to answer research question two and assesses the quality and educational adequacy of each of the six middle schools (Hawkins and Lilly, 1998). It is a comprehensive method for measuring the quality and educational effectiveness of school facilities. It is customarily used to assess the adequacy of a facility and is essential to determine if the physical plant adequately serves the instructional program. The measurement of the educational adequacy of school buildings is the primary purpose of this instrument (Hawkins and Lilly, 1998). It is categorized into six areas: the school site, structural and mechanical features, plant maintainability, building safety and security, educational adequacy, and environment for education. Each section is weighted with the maximum possible points for each section as follows: The School Site=100, Structural and Mechanical=200, Plant Maintainability=100, School Building and Security=200, Educational Adequacy=200, Environment for Education=200. The maximum score on this instrument is 1,000 points. A percentage rating is assigned to each section by dividing the total earned points by the possible points in each section. The percent rating is then averaged to determine the overall percentage rating of a campus. Once this is determined, Hawkins and Lilly (1998) provide a table of scores from which the campus rating is derived as follows: Very Inadequate=1-29%, Poor=30-49%, Borderline=50-69%, Satisfactory=70-89%, Excellent=90-100%. The results from these appraisals will be used as the standard for each building's quality and

adequacy as a learning environment. "The appraisal process achieves appropriate reliability through the development of a team consensus for each of the items." (Hawkins and Lilley, 1998, pg. 1) There is 72% duplicity of questions between each instrument or, fifty of the questions are identical on each instrument. Because the TLEA measures perception, responses to these duplicated questions are "agree-disagree" responses and the CEFPI measurements are purely numerical.

Design of the Study

The research design of this study is both descriptive and correlational. Research questions one and two describe the quality and educational adequacy of six middle school facilities as perceived by educators and as measured by an architect. The authors define descriptive research as the accumulation of data that is solely descriptive and does not explain relationships, test hypotheses, make predictions, or get at meanings and implications (Issac and Micheal, 1997, pg.50). As described by Heiman (1996), descriptive statistics organize and summarize data to describe important characteristics of the data. In this manner, the answer to questions one and two describe the quality and educational adequacy of middle schools in Humble ISD as perceived by educators and assessed by architects.

Within the broad definition of descriptive methods, this study is also designed to be correlational. Research question three will compare subjects' scores of perception of adequacy and quality of facilities to the subjects' perception the impact that the facilities have on the learning environment (Heiman, 1996). As is the case in all correlational studies, these variables were not manipulated; instead the goal is to infer the relationship

expected to be found in this population and to describe that relationship (Heiman, 1996, pg. 36). More specifically, research question three will measure the strength of the relationship between the perceived adequacy and quality of middle school facilities and the perceived impact that the facilities have on the learning environment using the phi coefficient. A phi value near 0 means there is no relationship and a value of 1.0 indicates a perfect positive relationship between two variables (Spatz, 2001). A perfect positive relationship indicates that a change in one variable is accompanied by equivalent changes in the same direction in the other variable. A phi score of -1.0 describes a perfect negative correlation or one in which a change in one variable is accompanied by equivalent changes in the opposite direction to that variable (Issac and Micheal, 1995).

Research question four explores the relationship between the perception of adequacy and quality of educators and architects. Fifty questions about adequacy and quality are the same on both instruments and this congruency necessitates discussion. Because the CEFPI instrument is a numeric assessment of a facility's adequacy and quality and the TLEA instrument is a measure of perception of adequacy, statistical analysis is not possible. Additionally, the CEFPI weights scores differently in each category and on each factor in each category. The additive scoring method utilizes a 6 level likert scale measurement of each item within a facility. The TLEA instrument uses a four point likert scale to measure perception of facility adequacy and the impact that each factor is perceived to have on the learning environment. Therefore, correlational statistical methods could not be designed to interpret such differing scoring, assessment,

and coding disparity. However, non-conclusive observations can be made about facility scores related to educator perception. Congruency is achieved between the identical questions if TLEA respondents perceived that a factor had adequacy and quality and the architect team assessed the factor as having adequacy and quality using the CEFPI instrument or if a factor is inadequate on both instruments.

Data Collection and Recording

Research question one necessitated the application of the TLEA survey for Middle Schools (O'Neill, 1999). As stated above, a perception scale was added to each question on this 82-item survey. The original existed in a point-and-click format so this change required the total reconstruction of an e-mail able, point-and-click, user-friendly instrument. The researcher utilized the skills of the district Internet supervisor to create this document as a first step in July 2005 with the permission of Dr. O'Neill. At the same time, a Letter of Permission to Conduct Research was obtained from Dr. Jim Parsons in the district Office for Assessment. The Internet supervisor created a protocol in the document such that the subject was required to answer every question before submission was allowed. When submitted by the subject, all responses became secure within the system, were disaggregated into a spreadsheet, and synthesized into bar graphs in another program. The population boundaries were determined by identifying only teachers, administrators, and professional support staff through e-mail addresses. This resulted in a population and email group of 512 subjects.

On September 1, 2005, surveys were sent to all subjects with an attached information sheet and basic instructions for submission. September response rates were

very low after 3 subsequent requests. On September 29, only 87 subjects, or 17%, of the population had responded. On October 2, 2005, building principals were contacted for assistance with subject participation. Five additional mailings were then sent to subjects with a variety of encouragers attached. On October 27, 200 surveys were returned for a 39% return rate. One final mailing occurred on November 1, 2005 and by November 10, 237 surveys were returned for a 47% response rate. Krejcie and Morgan (1970) in *Determining Sample Size for Research Activities* require a sample size of 200 from a population of 500. This return rate is well within the requirements of their research. A summary of the final participant response rates for this instrument follows on Table 6:

Table 6: Middle school educator return rates of the TLEA survey

Campus	Staff	# Returned	Pop. Ret. Rate	Bld. Ret. Rate
AMS	97	35	14.70%	36.10%
CMS	77	32	13.50%	41.50%
HMS	95	34	14.30%	35.70%
KMS	72	42	17.70%	58.30%
RMS	77	39	16.40%	50.60%
TMS	94	55	23.20%	58.50%
TOTAL	N=512	s=237		

The data collection process for the application of the CEFPI Appraisal Instrument was a much shorter process due to the fact that the subjects were middle school facilities. On September 20, 2005, the six building principals and their corresponding assistant superintendents were notified that this researcher and a district architect would assess their buildings in October. With permission granted, the research team applied the CEFPI instrument at the six middle school facilities during the weeks of October 3-14, 2005. In each case, the team walked through all spaces in these

buildings and on the surrounding external property (See Appendix C). After this initial walk through, the team went to the campus conference room to complete the survey instrument. In each case, consensus was reached on each question before it was recorded on the document as per the guidance of Hawkins and Lilley (1998). Completion of the 97 questions and preliminary data took approximately two hours per school with time economy increasing after each application. The results of these appraisals follow on table 7:

Table 7: CEFPI appraisal scores for middle school campuses in Humble ISD

Campus	Score (1000)	Percentage
AMS	856	85.6
CMS	925	92.5
HMS	928	92.8
KMS	965	96.5
RMS	955	95.5
TMS	979	97.9
AVERAGE	935	93.5

Data Analysis

Descriptive statistics produce a number or figure that summarizes a set of data. This study relies on frequency distributions in the form of graphs, frequency tables, relative frequencies, and central tendency (Spatz, 2001). Research questions one and two utilize bar graphs to describe response to and results of the instruments. Question three requires a correlational approach in describing the relationship between educator perception of building quality and educational adequacy and perception of the impact that the facilities have on the learning environment. The degree of association or strength of this relationship is determined. Due to the fact that the results from the

TLEA instrument is coded nominally, the Phi Coefficient is used (Hein, 1997) (Isaac and Micheal, 1997)). Research question four is an evaluation of the responses, scores, and indicators from each of the instruments. Existent patterns within these responses will indicate areas in the facilities needing modifications in order to increase the level of educational adequacy and quality in these facilities.

Methodology for Research Question One

The first research question: "What is the perceived educational adequacy and quality of Humble ISD middle level educational facilities and what is the impact of these facilities on the learning environment as reported by middle school teachers and administrators on the TLEA survey instrument?" was addressed through dual assessment on 82 characteristics of a middle level facility. Each respondent therefore, answered 164 questions about their facility. Each question was stated in such a way that agreement indicates adequacy and disagreement indicates inadequacy. The first assessment for a characteristic's educational adequacy and quality utilized likert-type or summated attitudinal scales. The subjects responded with varying degrees of intensity on the 4 level scale range from strongly agree to strongly disagree. Respondents had a choice of strongly agree, agree, disagree and strongly disagree. In order to quantify these responses and for economy of space in tables and charts, a nominal scale was applied to the likert scale: strongly agree=4, agree=3, disagree=2, strongly disagree=1. Because each question was worded as to assume adequacy and quality exists, numerically high "agree" scores equate to high adequacy and quality for each question. Low scores, or disagreement, equate to low adequacy and quality. If a respondent strongly agreed with

every question, a maximum quality and adequacy score of 328 would be attained. The lowest level of quality and adequacy is 82.

Similarly, each characteristic had the question "What do you perceive the impact to be on the learning environment" in a shortened statement form. The perception scale is cumulative for each section and can be applied in a stand-alone fashion for each characteristic. A nominal scale added to these responses for economy of space and can be equivalent to level of impact: no impact=1, minimal impact=2, moderate impact=3, significant impact=4. Therefore, if a characteristic had significant impact it would have a high numerical score.

The TLEA survey is divided into two categories: Educational Adequacy and Environment for Education. The scores on each of the characteristics were separately summed to arrive at an attitudinal and impact score on each section. The maximum attitudinal and impact score for the Educational Adequacy section is 188. The maximum score for Environment for Education is 140. These sectional scores are aggregated for each school and by characteristics in graphical representation. Each individual item is presented in histogram form with the percentage of the population reporting each quality, adequacy, and impact level on the X axis. If 51% or more of the respondents agreed or strongly agreed, the factor was rated as having quality and educational adequacy. Likewise, if 51% or more of respondents reported moderate or significant impact on a factor, it was considered to have an impact on the learning environment.

Each question regarding adequacy and impact is presented in a table of means and standard deviations. The adequacy and impact means are sorted in descending order

such that the highest means are first and lowest means are last. Sorting the data in this manner facilitates the identification of the most adequate factors and those with the highest impact on the learning environment. Finally, each question is graphed by its adequacy level and corresponding impact level. In this manner, the plotted points clearly show a trend in the gathered data.

Methodology for Research Question Two

The second research question: "What is the quality and educational adequacy of middle level educational facilities in Humble ISD as determined by the CEFPI Guide for Facility Appraisal Instrument for Middle School Appraisal ?" was addressed by six sections on this instrument, two of which directly correspond to the TLEA instrument. Each section is weighted with the maximum possible points for each section as follows: the school site=100, structural and mechanical=200, plant maintainability=100, school and building security=200, educational adequacy=200 (TLEA=188), environment for education=200 (TLEA=140). The maximum score that a facility may receive from this instrument is 1,000. The percentage rating is assigned to each section by dividing the total number of points for that section by the possible number of points for the section. The percentage ratings are then averaged to determine the overall percentage rating of educational adequacy and quality of each campus. From the table of scores on page MS-4 of each instrument, the following rating is determined: 1-29%=very inadequate, 30-49%=poor, 50-69%=borderline, 70-89%=satisfactory, 90-100%=Excellent. The assessment team, using this instrument, spent two hours on each of the six campuses. Each rater filled out an individual instrument while at the campus in question. Then the

team went through each question individually, came to consensus or agreement on a common score for each factor and documented the consensus score on a common instrument. In almost every case on each of the six campuses, the evaluator's scores were the same or varied by one or two points.

Methodology for Research Question Three

The third research question: "What is the relationship between the perceived educational adequacy and quality of the HISD middle level facility's as reported by teachers and administrators on the TLEA and the perceived impact of these facilities on the learning environment as reported by teachers and administrators on the TLEA?" is a relationship question. RM Thorndike defines this as correlation. This is the measure of the degree of relationship between two variables. From this question, the relationship between educator perception of educational adequacy and quality in a facility and educator perception of the impact that the facility has on the learning environment was determined (Keeves, 1988, pg. 613). As the scores on variable one change, there is a consistent pattern of change on the scores of the other variable. The nature of the relationship is described, as is the consistency of the change. Two important characteristics of this relationship exist, the type and the strength.

Research question three was answered using the Phi Coefficient which measures the strength of the relationship between the perceived adequacy and quality of middle school facilities and the perceived impact that the facilities have on the learning environment. The Phi Coefficient measures the degree and strength of relationship between two binary variables. A value of 0 indicates that there is no relationship and a

value of 1 indicates a perfect positive relationship between variables (Spatz, 2001). A perfect positive relationship indicates that a change in one variable is accompanied by equivalent changes in the same direction in the other variable. A phi score of -1.0 describes a perfect negative correlation or one in which a change in one variable is accompanied by equivalent changes in the opposite direction to that variable (Issac and Micheal, 1995). Phi is used with nominal data through 2-by-2 tables and the measure is similar to the Pearson Correlation Coefficient in interpretation. The difference in the two methods is that Phi adjusts the chi-square significance to factor out sample size.

The Phi Coefficient requires scores to be true dichotomies. This is achieved by coding educator responses to adequacy and impact either 1 or 2. The TLEA questions about the adequacy and quality of factors in facilities are stated such that an "agree" response indicates adequacy. Any level of "agree" response was coded as a 2. Any level of "disagree" responses was coded as a 1. Similarly, each factor has a "perceived impact on the learning environment" query. A significant or moderate impact response was coded as a 2. A minimal or no impact response was coded as a 1. While this process creates a true dichotomy from a set of four responses, it does have the effect of masking the complete picture that a 4-point likert scale can provide. There were 236 respondents and each respondent answered two questions about a facility characteristic for a total of 164 responses per subject. This resulted in 38,704 responses each coded 1 or 2. Therefore, the data was nominal and creates a true dichotomy which warrants the use of the Phi Coefficient to measure association. A "high-high" (2,2) score on any factor indicates a perfect positive correlation or direct relationship between adequacy

and quality and impact. A "low-low" (1,1) score on any factor indicates a perfect positive correlation also. A "high-low" or "low-high" (2,1 or 1,2) score indicates a negative correlation where adequacy has no impact or no adequacy has an impact on the learning environment (Huck, 2003). The Phi Coefficient scores for each of these questions are displayed through charts and matrices. These statistical procedures were performed by entering data onto spreadsheets in the *Statistical Package for Social Studies* (SPSS version 11.5, 2003).

Methodology for Research Question Four

The fourth research question states: "Is there congruency between the perceived adequacy and quality of middle school facilities as reported on the TLEA survey for educators and the quality and adequacy as assessed by the CEFPI instrument for architects?" Both instruments assess middle level facilities for educational adequacy, quality, and their impact on the learning environment. The TLEA instrument was derived from the CEFPI instrument through the dissertation of Dr. David O'Neil with the assistance of Dr. Hawkins of Texas A&M University. Fifty questions about adequacy and quality are the same on both instruments and this congruency necessitates discussion. Because the CEFPI instrument is a numeric assessment of a facility's adequacy and quality and the TLEA instrument is a measure of perception of adequacy, statistical analysis is not possible. However, non-conclusive observations can be made about facility scores related to educator perception. Congruency is achieved between the identical questions if the campus respondents perceived that factors in their facilities had adequacy and quality as reported on the TLEA survey and the architect team assessed

these factors as having adequacy and quality using the CEFPI instrument. Table 8 depicts the congruency between questions on the two instruments.

Table 8: Congruent questions on the TLEA and CEFPI instruments

TLEA Questions	CEFPI Questions	TLEA Questions	CEFPI Questions
1	5.1	48	6.1
2	5.2	49	6.3
3	5.3	50	6.4
4	5.4	51	6.5
5	5.5	53	6.2
6	5.6	54	2.4
17	5.7	55	1.3
18	5.8	56	6.6
19	5.9	57	6.7
20	5.10	59	6.8
21	5.10	60	6.9
22	5.12	61	6.10
23	5.13	62	6.11
24	5.11	63	6.12
27	5.14	64	6.13
28	5.15	65	6.14
32	5.17	66	6.15
33	5.18	67	6.16
34	5.19	68	2.8
35	5.20	69	6.17
36	5.18	70	6.15
37	5.23	74	6.11
40	5.17	75	6.11
41	1.10	77	2.2
42	5.22	78	2.4

Assumptions and Limitations of Methodology

Educators including teachers, administrators and professional support staff answered research question one. They received, answered, and returned their surveys through district e-mail. There was no assurance that the subjects understood each of the 82 questions. Furthermore, there was no assurance that a subject did not send in more than one response. There was no assurance that the addressee was actually the one answering the survey. Only administrators, teachers, and professional support staff from

school year 2004-2005, in Humble ISD middle schools were surveyed. Therefore, findings from this study may not be generalized beyond these narrow confines. The researcher was an administrator on the two campuses that had the highest return rates of the surveys. This certainly may have had an impact on this disproportion. Additionally, the researcher was widely known on all six campuses as the safety director for the district. This also may have had a bearing on the overall high return rate. The following limitation concerns the consolidation of responses on the TLEA instrument. If 51% or more of the subjects responded agree or strongly agree to the statements of adequacy and quality, those factors were considered to be adequate and have quality. If 51% or more of the subjects perceived moderate or significant impact on the learning environment, the factor was considered to have an impact. If 50% or less of the subjects disagreed, strongly disagreed, reported no impact or minimal impact, the factor was considered inadequate and not an impact to the learning environment.

Research question two was answered using the CEFPI instrument. The research team consisted of this researcher and a district architect. The fact that both are employees of the district could introduce bias into the building assessment and data collection process. Although, through inter-rater discussions, it is apparent that neither had a strong like, dislike, or affiliation with any of the six campuses. Hawkins and Lilley (1998) recommend that the evaluation team consist of one administrator and two to three architects. They also acknowledge that the instrument is suitable for administration by one person. In this study, a two-member team was used. This was the case because only one architect was available to assist in the research during this time of

rapid building in Humble ISD. This fact may cause a less accurate quantitative assessment than would have been obtained from 4 raters. The use of only two assessors may have the effect of reducing the clarity or fineness of the assessment of quality and adequacy. Construction was taking place during the assessment of one of the middle school facilities. This campus was in obvious disarray and while the evaluation team attempted to disregard this fact, some bias may have come into play.

Research question three was answered using correlational techniques. The Phi Coefficient necessitates the use of binary scoring. That is, the scores must be true dichotomies, in this case 1 or 2. However, a limitation to this technique is the masking of the data that takes place when reducing the 4-point likert responses to either 1 or 2. This may tend to group the responses in such a way that does not provide as fine analysis as may otherwise be possible. Furthermore, the collapsing of the 4-point likert scale to a dichotomy may impact the strength of the association between the two factors. There were 236 subjects in this study each answering 164 queries. The resulting data set for this question is 38,704 responses. This large number of responses may also mask the variation of the responses. The use of the Phi process appeared to be the best test of the degree of relationship that existed.

Research question four is merely a report of the level of agreement between educator perception of adequacy and quality of facilities and architect assessment of adequacy and quality of the same facilities. This agreement or congruency is a comparison of the level of agreement between subjects and the assessment team. The two instruments used to gather this information utilize differing scales such that

statistical testing was not possible. This is a limitation because no decisive conclusion may be drawn from the findings of this data.

CHAPTER IV

ANALYSIS AND COMPARISON OF DATA

Research Question One

Research Question One states: What is the perceived educational adequacy and quality of Humble ISD middle level educational facilities and what is the impact of these facilities on the learning environment as reported by middle school teachers and administrators on the TLEA survey instrument? This question is addressed through an instrument developed by Dr. David O'Neill and designed to measure the perception levels of middle school educators on two variables. Each question is phrased to illicit a response as to the quality and educational adequacy in 82 areas of a campus. Secondly, within each question is an additional measurement of the perceived impact that each area has on the learning environment. Roeser et al. (2000) noted that the middle level student, the customer, is influenced heavily by the physical environment in which they learn. They are unique socially, developmentally, physically, and physiologically, and therefore require specific characteristics within their learning environment. The learning environment, especially the physical surroundings, impact perceptual learning, concept formation, language development, socialization, creative growth, attitudes towards school, reduction of vandalism, and attendance rates in school (Lackney, 2003). The learning environment is formed by the relationship between the architectural facility and the surrounding physical environment (Loughlin and Suina, 1982). It is important, therefore, to understand the quality and educational adequacy of

the learning environment and the perceived impact on the learning environment by those who use the facility in order to educate children, the teachers.

This section investigated this point through the analysis of every question presented within the TLEA instrument. This will be accomplished through the graphic representation of the results from each of the two questions about the 82 areas described above. A histogram will reveal the results for each area with the level of agreement and perception levels on the X axis. The levels of agreement from left to right are strongly disagree (SD), disagree (D), agree (D), and strongly agree (SA). Next to the agreement levels are the following perception levels: significant impact (SI), moderate impact (MOI), minimal impact (MI), and no impact (NI). This system is used to economize on space, facilitate comparison, and visualize trends. The X axis is labeled "PERCEPTION LEVEL" because this best describes the scale that is depicted. The percent of the respondents or sample that answered at the assigned levels is on the Y axis. The Y axis is labeled "PERCENT OF SAMPLE".

Figure 1 below depicts the responses to statement 1: Size of academic learning (classroom) space meets state standards (700 sq. ft.).

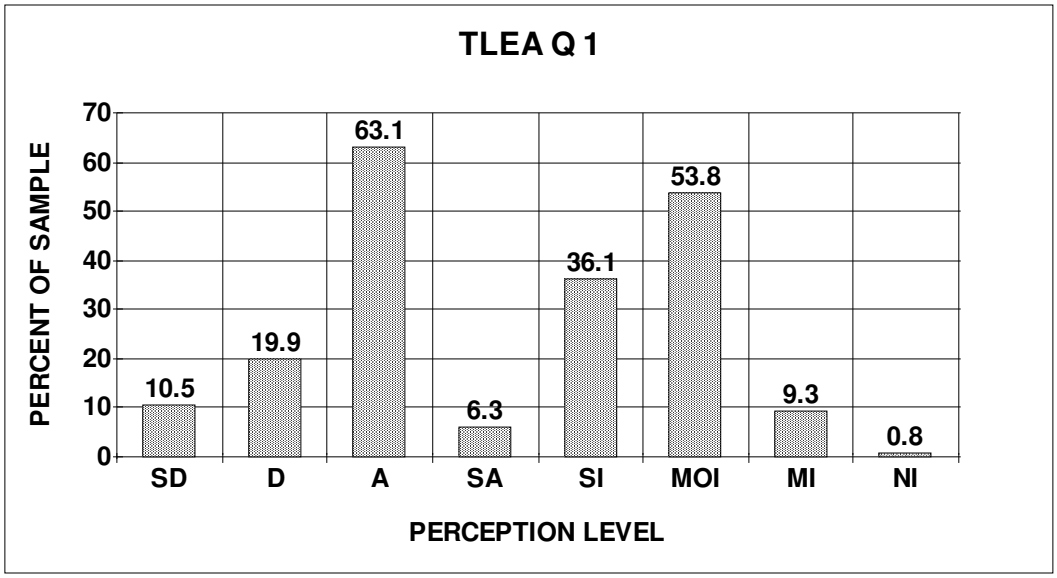

Figure 1: Size of academic learning (classroom) space meets state standards (700 sq. ft.).

The response to this question depicts that most educators agree that the classrooms in the six middle schools in Humble ISD meet state size standards. A large percent of respondents (30.4%) disagree with this statement however. This can possibly be attributed to those educators who perceive the space not adequate in size even though it may meet state requirements. Earthman (2002) notes that crowded school conditions result in low teacher moral, absenteeism, and pervasive unhappiness. If we combine the percent of respondents who consider this aspect a significant and moderate impact we see that 91% perceive a significant or moderate impact on the learning environment. This supports the findings of Kowalski (2002), Chandler (1983), and Brubaker (1998). They found that smaller learning environments are more effective in student learning,

result in positive parent and child perceptions, improves student performance, and increases teacher morale.

Figure 2 depicts the responses to statement 2: Classroom space permits arrangements for small group activity.

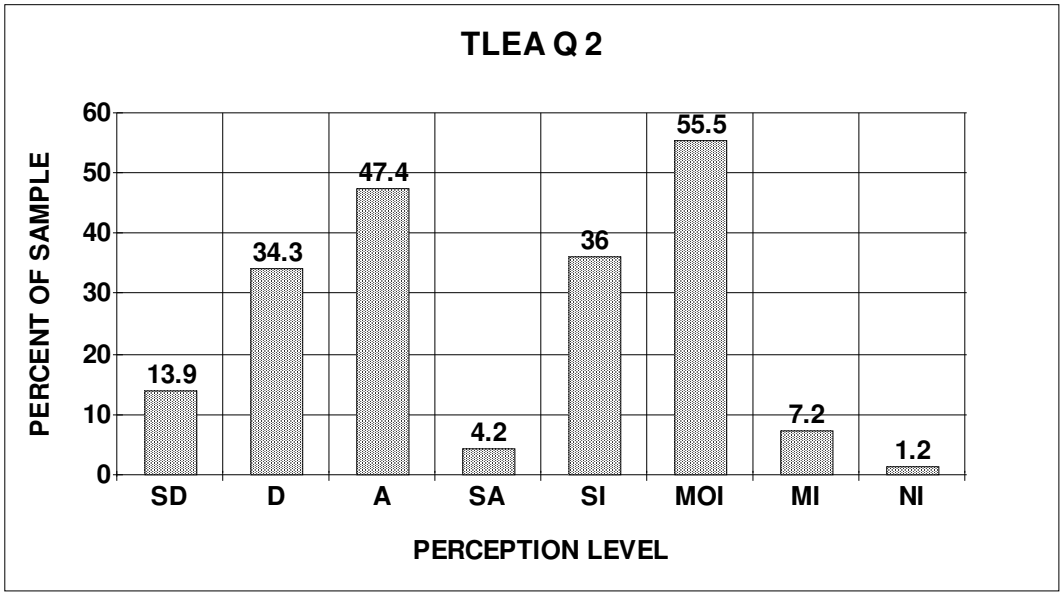

Figure 2: Classroom space permits arrangements for small group activity.

A large percentage of the middle school educators in these facilities agree that existing classroom space permits arrangements for small group activity. However, a large percentage of respondents almost equal to those who agreed, disagree that the space is adequate for small group programs. What is clear though is the perception that this factor impacts the learning environment. A very large percentage of respondents (91.5%) perceive that this factor has a significant to moderate impact on the learning environment. This perception that classroom space that permits arrangements for small

group activity has a significant impact aligns with the research of Clayton and Forton (2001). This author found that flexible classroom spaces that allowed for small group activities enhanced the learning environment. Classrooms must fit student's bodies and allow for interpersonal interaction. She also found that classrooms often have excessive furniture, and cluttered materials which limit the ability of a classroom space to support this developmental need. This flexibility was found to be critical to student development, learning, and attitude.

Figure 3 depicts the responses to statement 3: Location of academic learning areas is near related educational activities and away from disruptive noises.

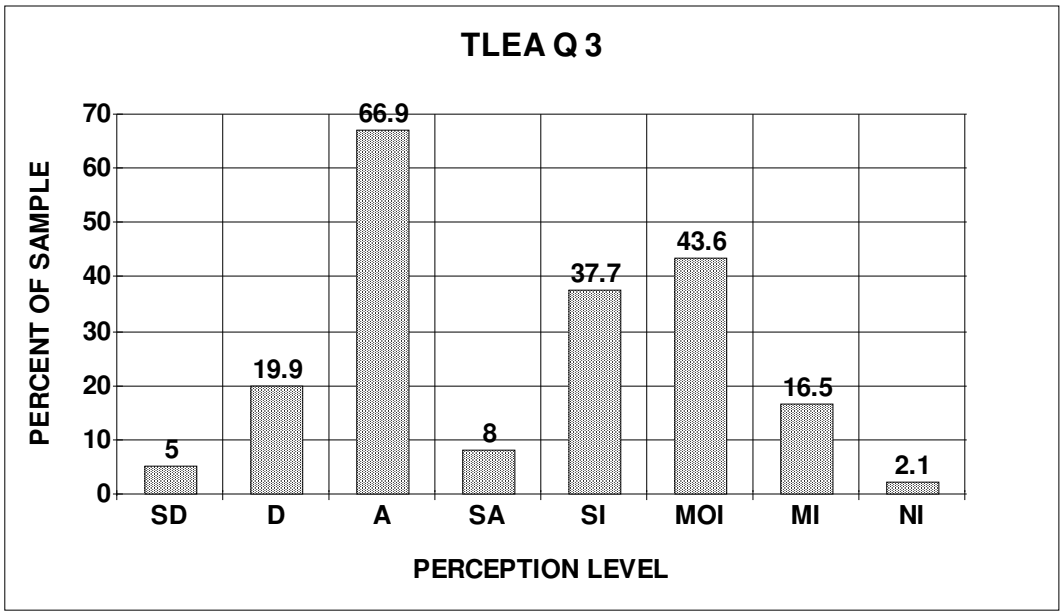

Figure 3: Location of academic learning areas is near related educational activities and away from disruptive noises.

A significant percent of respondents agree that their academic learning areas are near related activities and away from disruptive noises. This is representative of what exists in the areas around each of the six middle school campuses. Each is in a suburban setting with large residential housing subdivisions surrounding each campus. Only one of the middle schools, AMS is adjacent to a major thoroughfare. Commensurately, the respondents perceive that this aspect has a significant impact on the learning environment. Schneider (2002) and Earthman (2002) substantiate this perception. High levels of external noise reduced achievement test scores, increased dissatisfaction, stress levels, and misbehaviors. Additionally, they found that noise abatement procedures reduced low test performance. Boggio (2004) found that students do not get used to this type of distraction and in fact, over time, their health suffers when exposed to prolonged periods of disruptive noises near their learning areas.

Figure 4 depicts the responses to statement 4: Personal space in the classroom away from group instruction allows privacy time for individual students.

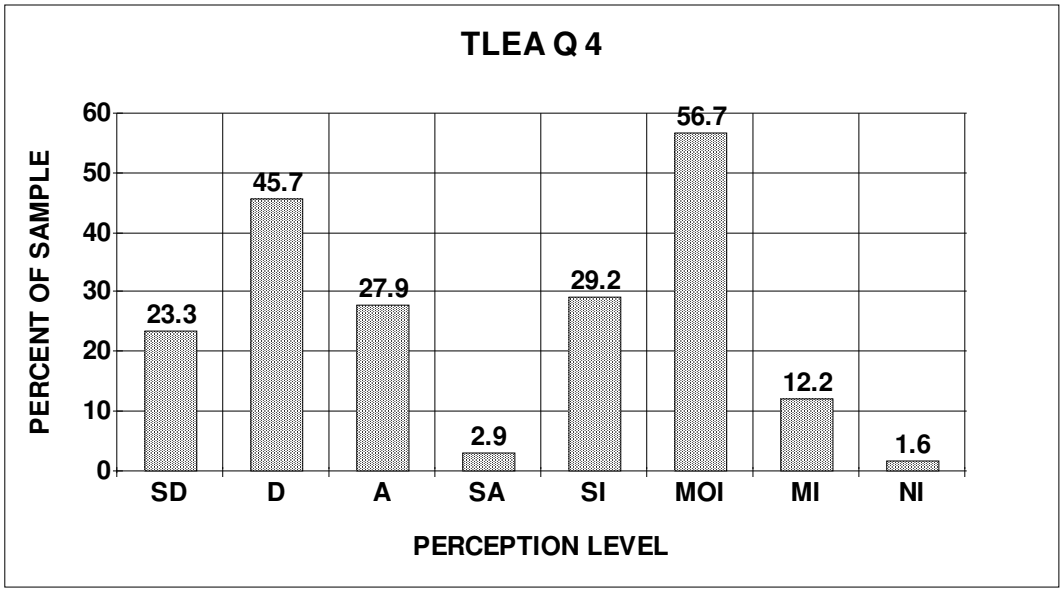

Figure 4: Personal space in the classroom away from group instruction allows privacy time for individual students.

Educators disagree with this statement at the 69% level. The respondents perceive that personal space is limited to the point that privacy time for individual students is not adequate for the educational program. Furthermore, respondents overwhelmingly perceive that this aspect has a significant to moderate impact on the learning environment. This is supported by the research of Jilk (1992) on the learning environment at a high school level. In his research he found true what the respondents also see as a significant impact on the learning environment. Students that have access to personal space away from other students have increased self concept and improved attitudes. These spaces allow students to work independently, keep books and other materials secure, do small projects, and connect to technology.

Figure 5 displays the responses to statement 5: Storage for student materials is adequate.

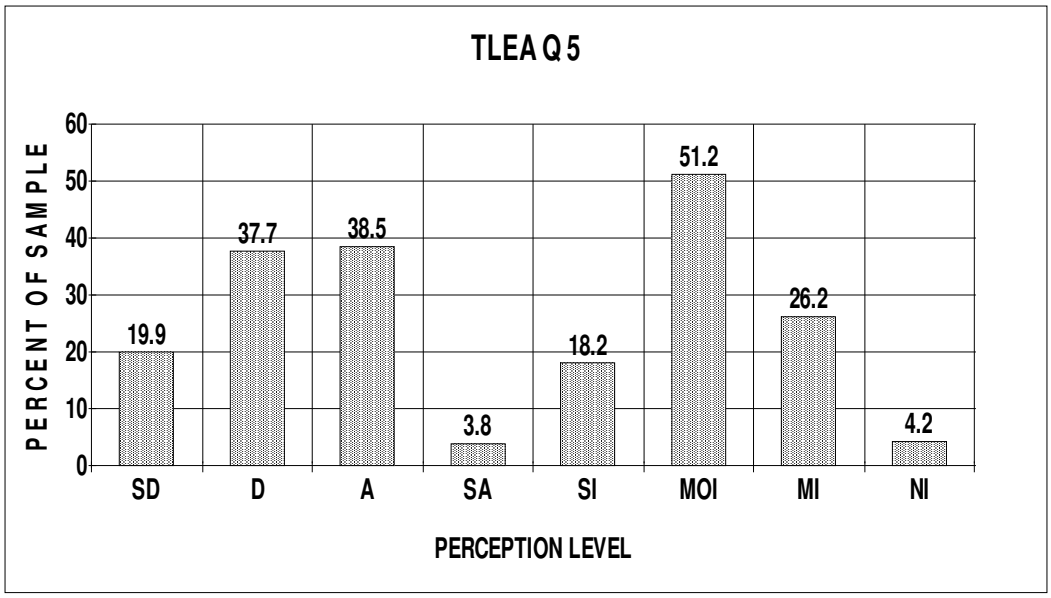

Figure 5: Storage for student materials is adequate.

Respondents strongly disagree and disagree to a large degree (57.6%) that storage for student materials is adequate. The subjects agree and strongly agree at a 42.4% level that storage is adequate. They also perceive that this aspect of their facilities has a significant and moderate impact at a 69.4% level. These findings are unexpected due to the fact that each of the buildings provides every student with lockers in the hallways. However, storage space for students in the classroom is limited. This aspect can result in cluttered classrooms or impeded movement around the classroom which can impact the learning environment in a negative manner. When considering the middle school child

in a cluttered environment. Finks (2002) supports this notion in his research on the middle school child. In this category, the middle school child requires adequate space to move freely which reduces frustration. If this space is impeded by student materials because of the lack of storage space, the learning environment is negatively impacted.

Figure 6 depicts the responses to statement 6: Storage for teacher materials is adequate.

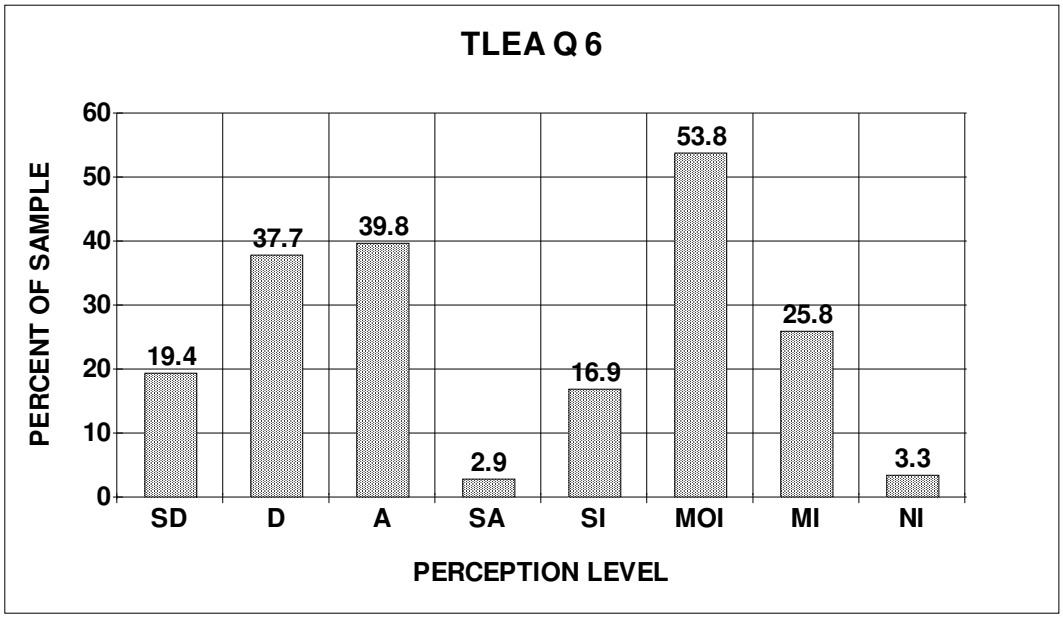

Figure 6: Storage for teacher materials is adequate.

Very few respondents strongly agree that teacher storage space is adequate in their facilities. Thirty-nine point eight percent agree that teacher storage space is adequate while 57.1% of the subjects disagree that storage is adequate. A small percent of the respondents perceived minimal or no impact on the learning environment (29.1%) while

70.7% perceived a significant to moderate impact on the learning environment. Just as educators perceived that student storage space has an impact on the learning environment, educators perceive the need for similar spaces to store their teaching materials or personal materials. A study by Lang (2002) found that room layout, specifically, teacher storage space was the most important factor in teacher satisfaction with their classrooms. Teacher's desire for adequate space ranked highest in the room layout section of the survey issued to them. This corroborates the importance of teacher storage space to the respondents in this study. Respondents (70.7%) perceived that this factor had a significant impact on the learning environment.

Figure 7 depicts the responses to statement 7: Classrooms can be arranged to enhance the teaching/learning objectives.

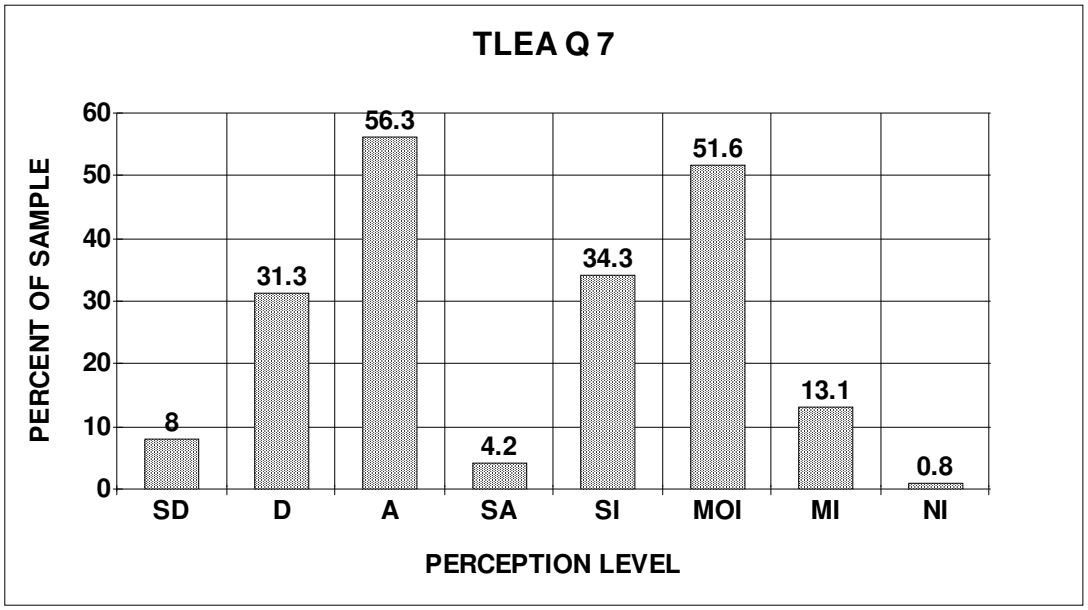

Figure 7: Classrooms can be arranged to enhance the teaching/learning objectives.

Sanoff, (2000) found that flexible classroom spaces where teachers can re-arrange the existing furniture and walls suggest a student-centered learning environment. Flexible sizing and arrangement allows the teacher to influence and optimize differing child learning styles. This builds confidence in students and empowers them (Lang, 2005). The flexible classroom allows for multiple activities from projects to presentations, tutoring or team activities (Abramson, 2004). At the physiological level, flexible classrooms allow for the growth of mental functions in children. Brain development is strengthened by the ability of the student to move around the classroom, influence spatial arrangements, and participate in varied activities (Chan, 1996). The following 4 statements and analysis each relate directly to flexible classrooms and their importance to the learning environment. In the above chart, 60.5% of the respondents agree and strongly agree that their facilities are flexible enough to allow re-arrangement to enhance learning and teaching objectives. A very large number (85.9%) of the respondents perceive this factor to have a significant or moderate impact on the learning environment. Their perception that this is an important factor correlates directly to the findings of Sanoff, Lang, Abramson, and Chan.

Figure 8 depicts the results from statement 8: The school facility is adaptable to users' needs.

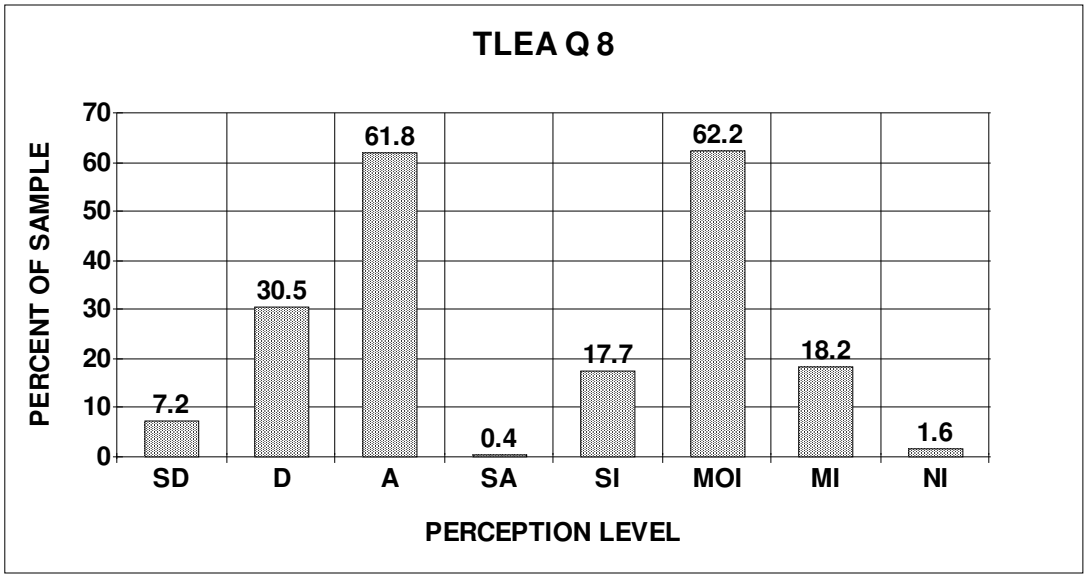

Figure 8: The school facility is adaptable to users' needs.

Flexibility and mobility are critical points in creating effective, adequate, and high quality learning environments. Facilities that support varied learning styles and a users needs, both student and educator, create the optimal learning environment (Diehl et al., 1998). This adaptability is present in the view of 61.8% of the respondents. However, 37.7% of the subjects disagree to some level that this condition exists. Again, we see that their perception aligns with the research on this factor. Subjects perceived that this factor strongly or moderately impacted the learning environment at 79.9% level. While subject's perceptions suggest that the quality and adequacy of their facilities in the area of adaptability leaves room for improvement, they also know and value the importance of this factor for a facility.

Figure 9 depicts the responses to statement 9: The school facility accommodates a variety of learning styles of students.

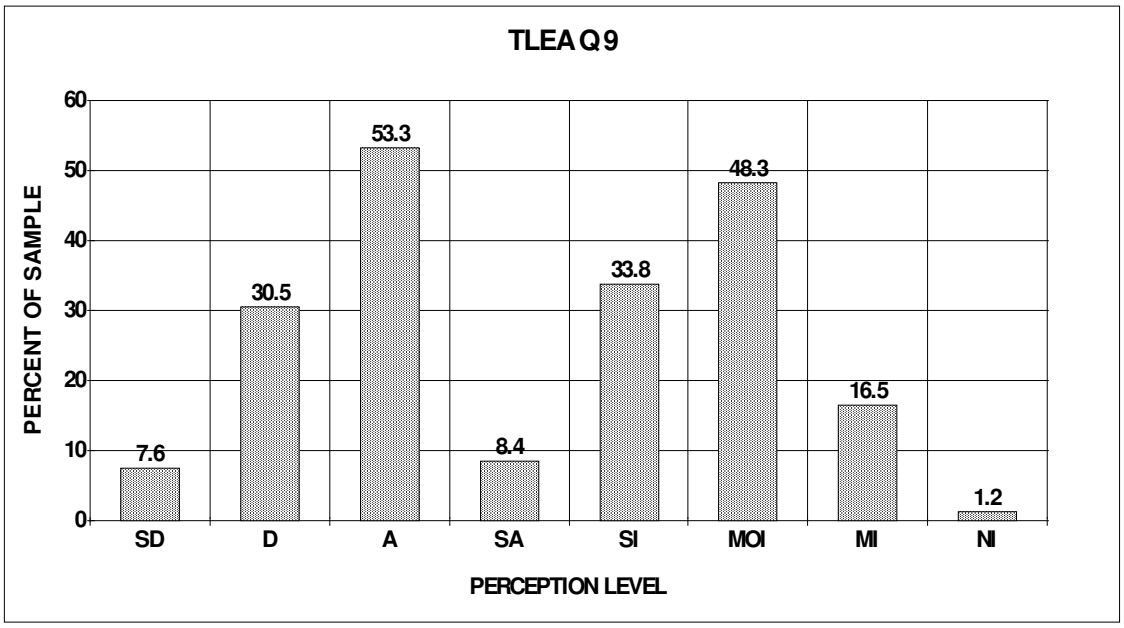

Figure 9: The school facility accommodates a variety of learning styles of students.

Flexible facilities will accommodate a variety of learning styles (Valiant, 1996). Respondents agree that this exists at a 61.7% level in their facilities and disagree at a 38.3% level. There is some degree of disagreement on this point among the subjects. However, the respondents agree strongly on the level of impact that this factor has on the learning environment. Subjects perceive at an 82.1% level that this factor significantly or moderately impacts the learning environment. The modern classroom must be responsive to multiple delivery methods to serve varied ways of learning. The classroom must be flexible and adaptable enough to accommodate multiple learning styles (Kennedy, 1999). Again we see an agreement between the research on this factor and the response from subjects concerning this factor in their schools. A majority of respondents perceive that

this aspect has an impact on the learning environment and the research supports this perception.

Figure 10 depicts the responses to statement 10: Large flexible space and/or workstations are available to accommodate student projects.

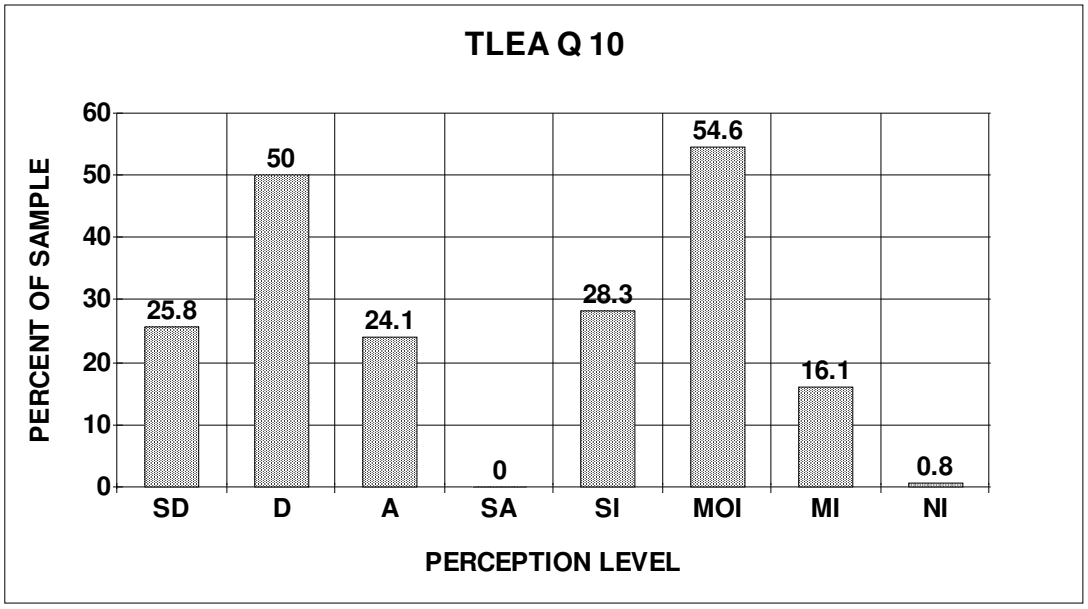

Figure 10: Large flexible space and/or work stations are available to accommodate student projects.

Individual learning alcoves and personal space can facilitate individualized student work (Lackney and James, 1999c). Work stations in the form of well defined activity pockets contribute to a greater degree of engagement and even increased achievement on standardized tests. Secluded work and study spaces within classrooms are important to student development, success, and increased on-task project work (Moore and Lackney, 1994). A large majority of the respondents (75.8%) disagree that their facility has

flexible space or workstations to accommodate student projects. Yet, a large majority (82.9%) perceives that this factor has a significant and moderate impact on the learning environment. Moore and Lackney support this perception with the fact that individual study spaces, work stations, or activity pockets have a major impact on the learning environment in a facility. In fact, Moore and Lackney (1994) found that student achievement is positively impacted by the availability of these types of flexible spaces in the classroom environment. Especially at the middle school level, these types of spaces are needed for the customers to work on personal projects, decompress, and self-evaluate (Long, 1993). The following seven statements concern the use of technology and computers in middle school facilities.

Figure 11 depicts the responses to statement 11: Computers in classrooms and computer labs have functional furniture designed for their use.

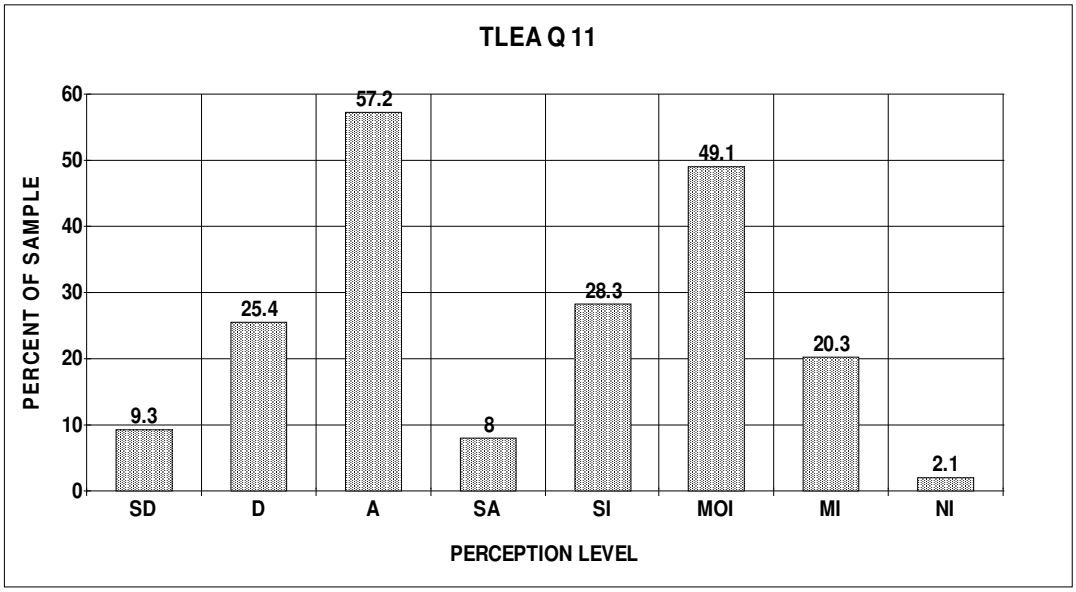

Figure 11: Computers in classrooms and computer labs have functional furniture designed for their use.

The "No Child Left Behind" (NCLB) act of 2001 includes a recommendation that by the eighth grade, all students should be technologically literate. It repeatedly references technology as an important source of support for teaching and learning across the curriculum. K-12 educators have made great strides in readiness and ability to use technology and foster the learning of core content. A high level of emphasis has been placed on educational technology to support learning and to increase analysis, comprehension, collaboration, and decision making (McMillan-Culp, Honey, and Mandinach, 2003). Therefore, adequate, high quality technology systems in school facilities are a critical part of the learning environment. Subjects are not in complete agreement about this factor in their facilities. Thirty-four point seven percent of respondents disagree and 65.2% agree that computer classrooms are outfitted properly.

Yet, 77.4% of subjects perceive this aspect to have a significant or moderate impact on the learning environment.

Figure 12 depicts the responses to statement 12: Classrooms have telephones for communicating both within and outside the facility.

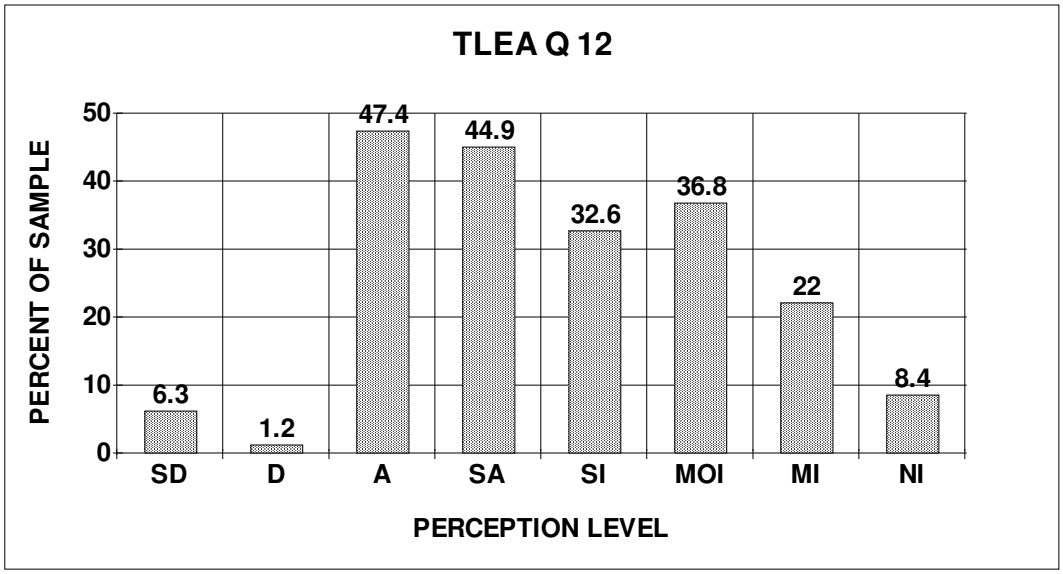

Figure 12: Classrooms have telephones for communicating both within and outside the facility.

Respondents overwhelmingly agree that classrooms are provided with telephones (92.3%). They also perceive at a 69.4% level that telephones have a significant and moderate impact on the learning environment.

Figure 13 depicts the responses from statement 13: Classrooms have logical, well designed, integrated technology systems.

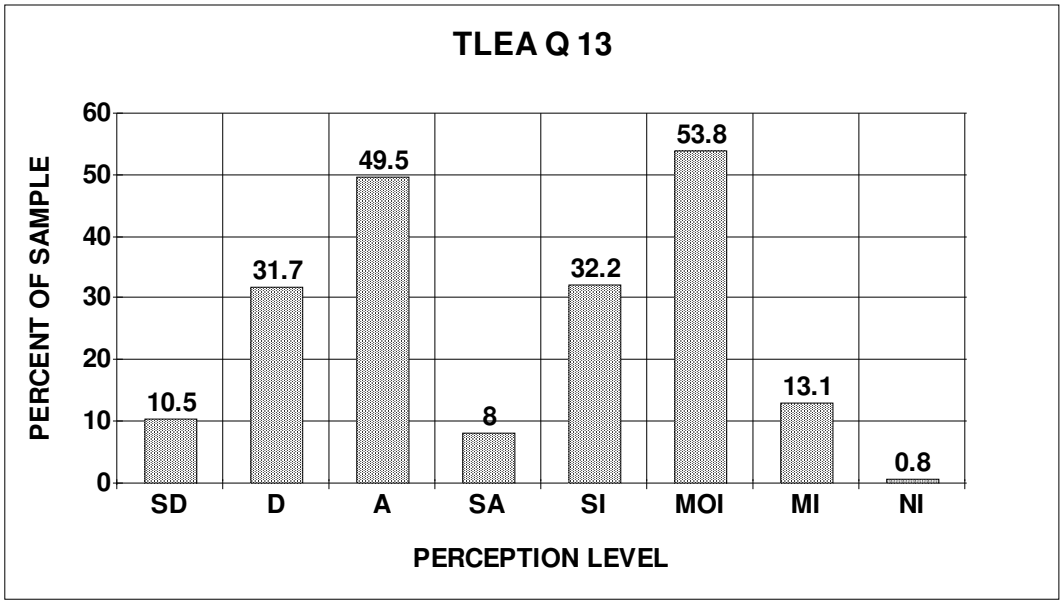

Figure 13: Classrooms have logical, well designed, integrated technology systems.

Integrated technology systems, or those that are matched to the content standards and curriculum are present in these middle school classrooms as reported by subjects at a 57.5% agreement level. A significant percentage of subjects (86%) perceive this aspect to have significant or moderate impact on the learning environment. What is important about this factor is that technology is more than internet connections and computers. The question that campuses and educators must ask to determine if their technology is effectively utilized is "Are students using technology in ways that deepen their understanding of academic content and advance their knowledge of the world around them?" Technology includes an array of devices and systems to include video and digital cameras, handheld computers, cell phones, computers, inter and intranet connections and other devices still in development. All of these must be infused into the instructional

program or be programs unto themselves to be adequate and demonstrate high quality. Additionally, to be adequate, technology systems must support teachers as they work in teams.

Figure 14 depicts the responses to statement 14: School has technology plan that includes development of environment for interdisciplinary teaming

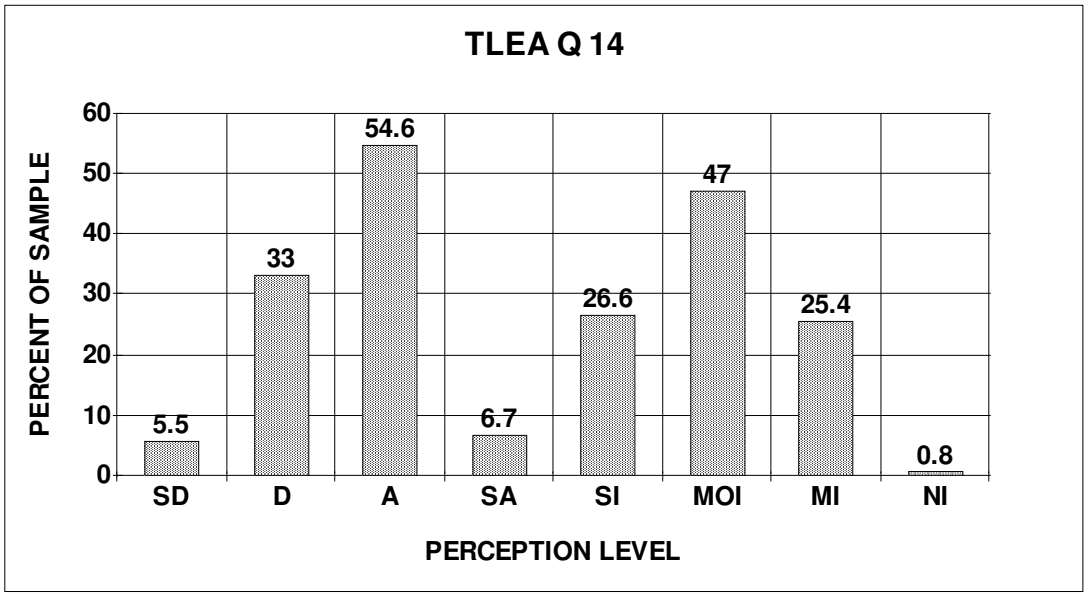

Figure 14: School has technology plan that includes development of environment for interdisciplinary teaming.

Respondents agree at a 61.3% level that their campus has a technology plan and that it includes development of an environment for interdisciplinary teaming. There is disagreement at a 38.5% level that this factor is present. Respondents perceive that this aspect has an impact on the learning environment at a 73.6% level. Technology plans are critical to ensuring that technology dollars have an impact on students, staff, and the

community. These plans must have a vision of what the technology systems will look like in three to five years. The plan must identify where the campus is in terms of technology and must have a background in research. The plan must integrate technology to the curriculum to optimize benefit to students. There must be a professional development plan with a sound infrastructure to support networks and equipment. Future monies must be allocated and ongoing monitoring and assessment of the adequacy and quality of technology systems must be conducted (Bennett and Everhart, 2003). This plan is critical to effective use of technology on any campus and subjects agree that it has an impact on the learning environment.

Figure 15 depicts the responses to statement 15: Classrooms have computers that are networked for both intranet and internet utilization.

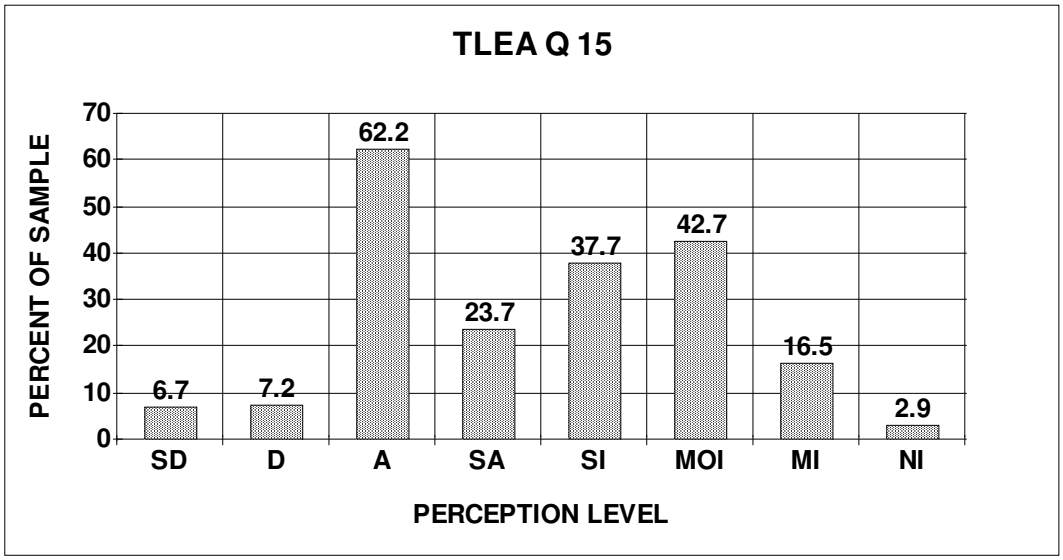

Figure 15: Classrooms have computers that are networked for both intranet and internet utilization.

Eighty-five point nine percent of the respondents agree that this factor exists in the middle schools in this study. The subjects perceive this to be a factor that impacts the learning environment at 80.4%.

Figure 16 depicts the responses to statement 16: There are sufficient and well located electrical outlets available in the instructional areas of the building

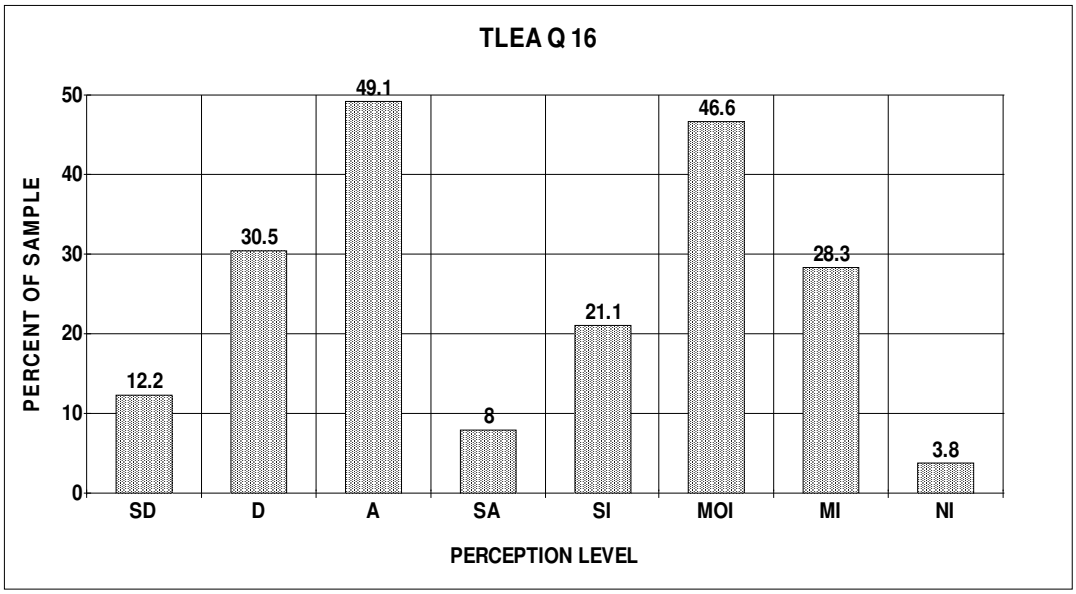

Figure 16: There are sufficient and well located electrical outlets available in the instructional areas of the building.

Subjects are divided on this aspect of their facility because 42.7% disagree that sufficient numbers of outlets exist and 57.1% agree that sufficient numbers exist. They perceive this aspect to have an impact on the learning environment at a 67.7% level.

Figure 17 depicts the response to statement 17: Size of specialized learning areas meet state standards. (e.g. computer classrooms are a minimum of 900 sq. ft.). This

marks the beginning of 14 questions about specialized learning spaces such as libraries, gymnasiums, outdoor facilities, and music rooms.

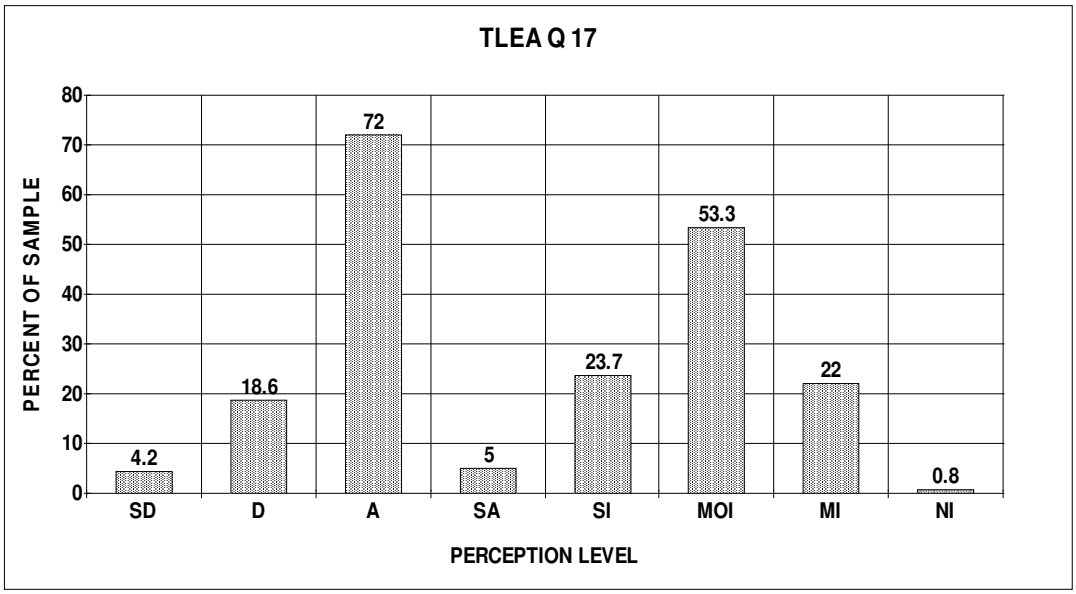

Figure 17: Size of specialized learning areas meet state standards (e.g. computer classrooms are a minimum of 900 sq. ft.).

In specialized learning areas it is critical to determine the typical class size for the specific program. The general guideline for the allocation of space of this type is approximately 25-30 square feet per student. Schools designed for the program offered usually provide adequate, quality spaces for specific instructional needs. If the building is not tailored to meet the specific need of specialized instruction, the area should evolve from the instruction to meet the need of that instruction. In other words, form should follow function (Hawkins and Lilley, 1998). Subjects in these middle schools agree at a 75% level that their facilities meet state standards for specialized learning areas. They

perceive that this aspect impacts the environment significantly and moderately at a 77% level.

Figure 18 depicts the response to statement 18: Design of specialized learning areas is compatible with instructional needs of students.

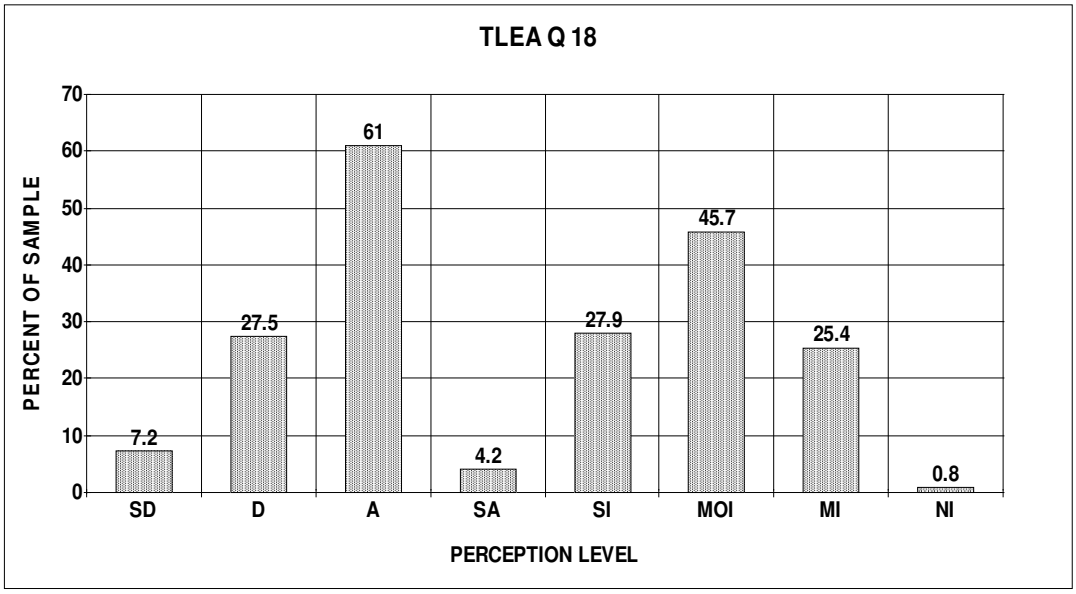

Figure 18: Design of specialized learning areas is compatible with instructional needs of students.

The purpose of middle level schools is to promote young adolescents intellectual development. The learning environment at this level must promote creative thinking, problem solving, effective communication, social adaptation, and factual foundations (Jackson & Davis, 2000). Young adolescents have very distinct developmental characteristics and instructional needs that mandate responsive facilities. Educators in these facilities agree at a 65.2% level that their facilities support the instructional needs

of their students. Their perception also aligns with the research which suggests that this aspect has a significant and moderate impact on the learning environment at a 73.6% level. The importance of this aspect is further supported when we consider the percent of subjects who perceive that this aspect has no impact on the learning environment. The extremely low percent of respondents who perceive that this aspect has no impact on the learning environment also suggests that most educators believe that this aspect is important.

Figure 19 depicts the responses to statement 19: Library/Resource/Media Center provides appropriate space, occupies a space of a minimum of 2,100 sq. ft., and acts as an instructional lab.

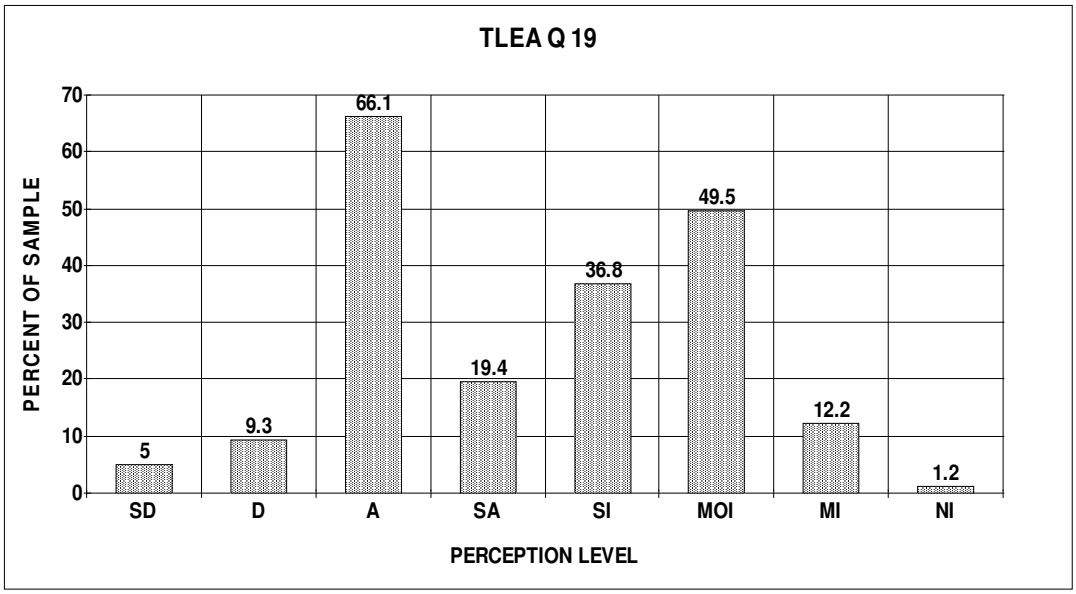

Figure 19: Library/Resource/Media Center provides appropriate space, occupies a space of a minimum of 2,100 sq. ft., and acts as an instructional lab.

A large percent of respondents (85.5%) agree and strongly agree that these factors exist in adequate form on their campuses. An even higher percentage (86.3%) perceives that these factors have a significant to moderate impact on the learning environment. Kolleeny (2006) redesigned libraries in Brooklyn and through the process found that libraries and media centers serve as gathering spots for students where they can work together and deliver presentations. These areas provide access to the world at large and appear to increase children's confidence when they are arranged appropriately. These areas must be instructional labs where flexibility is the key design component.

Figure 20 depicts the responses to statement 20: Gymnasium facilities adequately serve physical education instruction.

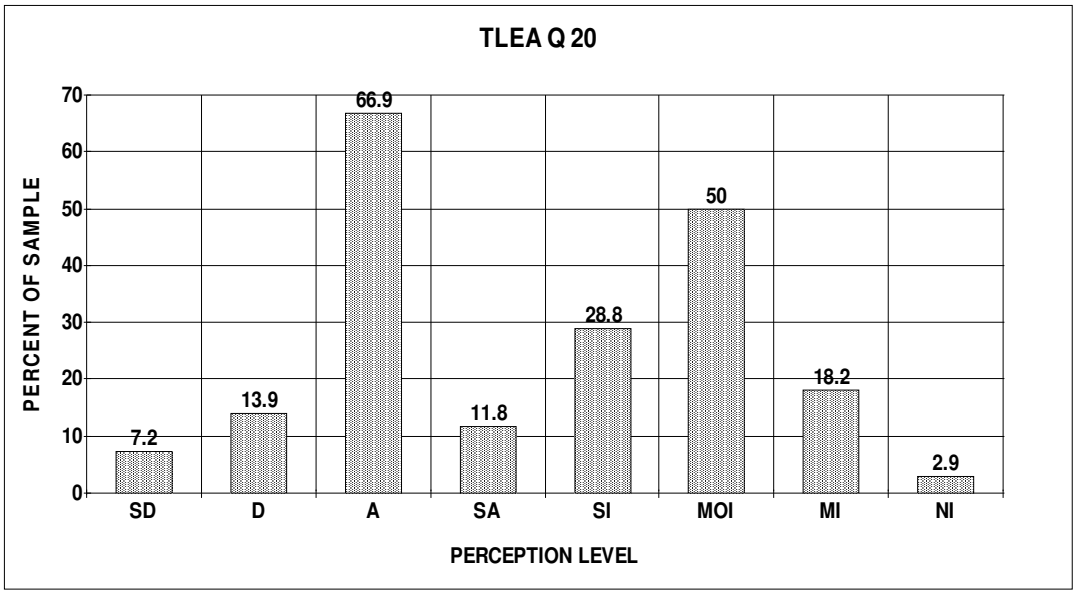

Figure 20: Gymnasium facilities adequately serve physical education instruction.

Subjects agree and strongly agree at a 78.7% level that gymnasium facilities serve their purpose in these schools. Respondents also perceive at a 78.8% level that these factors impact the learning environment at a significant and moderate level.

Figure 21 depicts responses to statement 21: Outdoor facilities adequately serve physical education instruction.

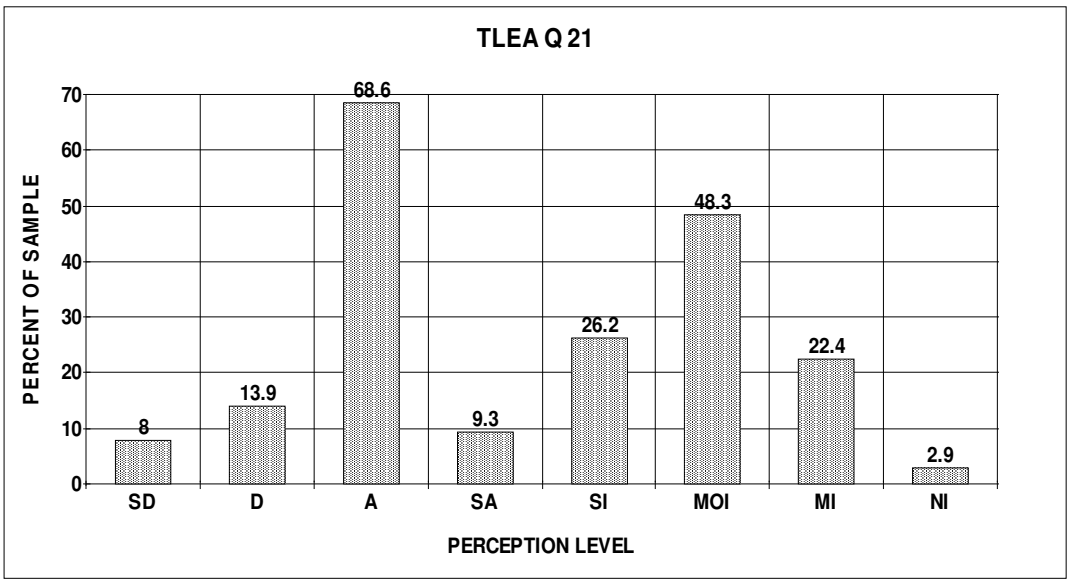

Figure 21: Outdoor facilities adequately serve physical education instruction.

Respondents agree (82.5%) that outdoor facilities at these campuses serve physical education instruction. They perceive (48.3%) that this aspect has a moderate impact on the learning environment.

Figure 22 depicts responses to statement 22: Music programs are provided adequate sound-treated space.

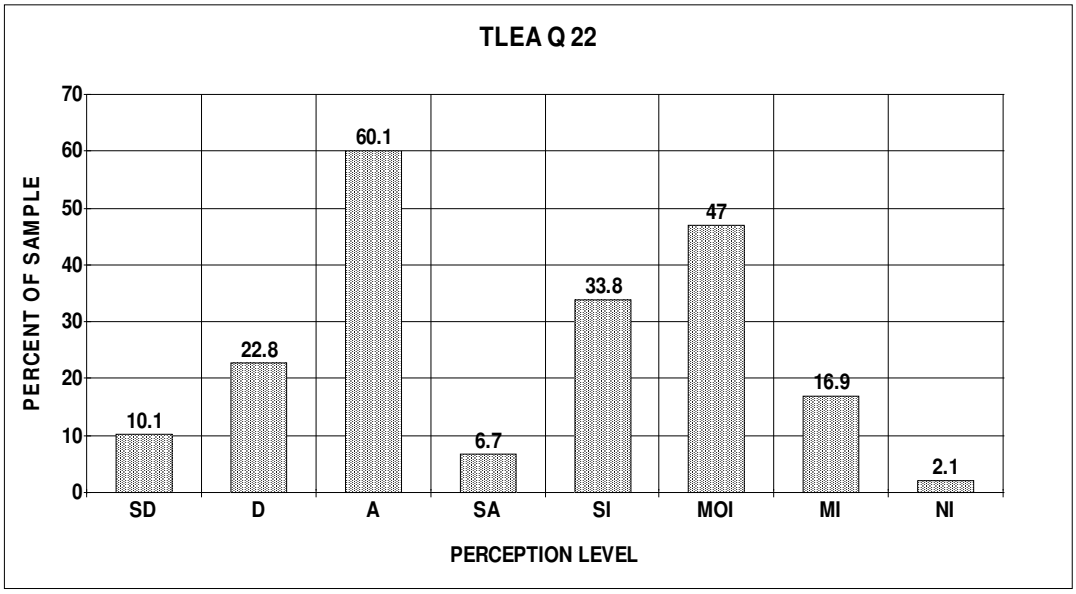

Figure 22: Music programs are provided adequate sound-treated space.

Music is learned through listening. Therefore, space and acoustical treatment is critical for effective and adequate music facilities. Panels for sound absorption and diffusion on the ceilings will help create a proper acoustical environment. Finishing materials such as carpet alone are not adequate because they do not absorb proper frequencies and reverberation (Djerf, 1999). In these facilities, subjects agree that proper sound treatment exists at a high level (66.8%). However, there is some disagreement present. Respondents disagree that this factor exists at a 32.9% level. This could be due to the fact that this is a very specialized question for an uncommon space in each of the schools and educators may not know or understand the question. Respondents perceive that this factor has a significant to moderate impact on the learning environment at a 80.8% level.

Figure 23 depicts the responses to statement 23: Space for art is appropriate for instruction and supplies/equipment are adequate.

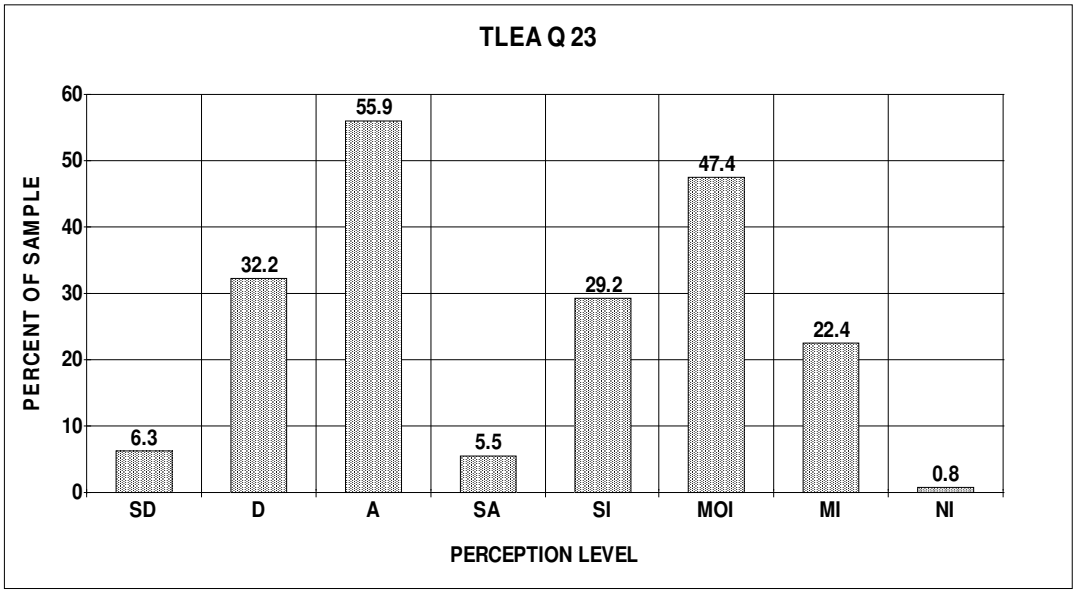

Figure 23: Space for art is appropriate for instruction and supplies/equipment are adequate.

Schools in Aldine, Texas developed an arts infused curriculum based on research that showed training in the arts can enhance student learning in core academic subjects. The Department of Education found through researching the subject that emphasizing art can actually increase test scores and attendance (Abramson, 2005). In the schools surveyed, subjects agree on two levels at 61.4% that their campuses have adequate space for art programming. However, 38.5% disagree that this factor exists. Again, this may be due to the specialized and secluded subject area of this statement. Subjects perceive at a 76.6% level that this factor has a significant to moderate impact on the learning environment. This perception level is in alignment with the research findings on the importance of art to the learning environment, quality, and adequacy of the facility.

Figure 24 depicts the responses to statement 24: Science program is provided sufficient space and equipment with science lecture-lab rooms a minimum of 1,000 sq. ft.

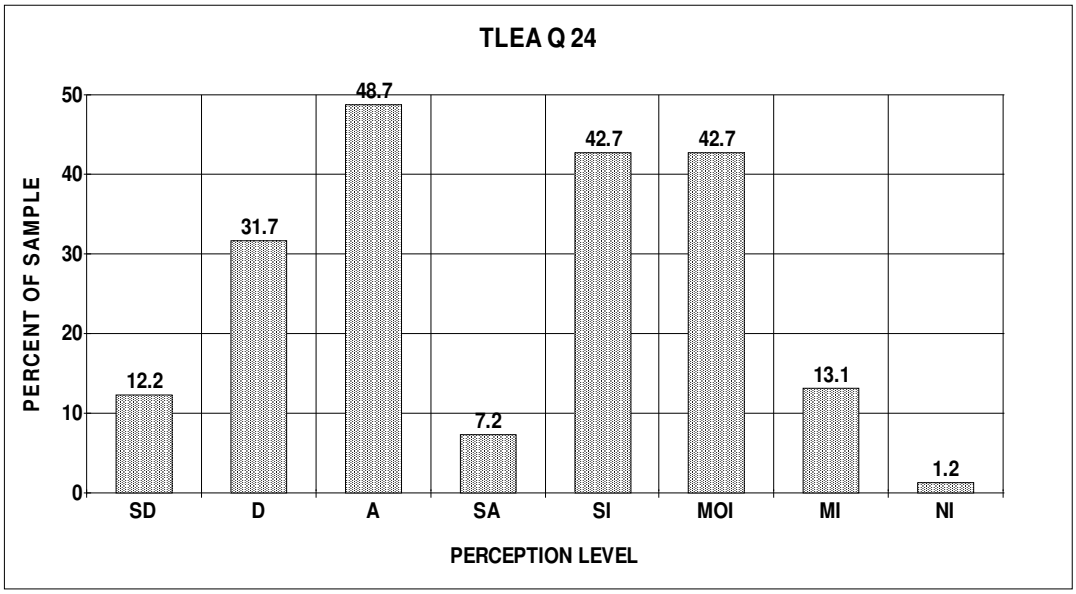

Figure 24: Science program is provided sufficient space and equipment with science lecture-lab rooms a minimum of 1,000 sq. ft.

At the middle school level, science is a very important instructional area. Classroom space and laboratory space must be provided in order to be adequate. Lab stations are needed for small groups of students and in sufficient numbers to accommodate classrooms with 20-25 students. Teacher preparation space is critical to the quality of the facility and is often located between two instructional areas to serve more than one teacher (Hawkins and Lilley, 1998). Fickes (2000) reports that middle school science classrooms have added more laboratory concepts without decreasing the distance to

student workstations. In order to increase adequacy and quality, modern science classrooms must be mobile and flexible where moveable tables, work stations, and student desks are optimized. Respondents to this statement are in disagreement on this point. Fifty five point nine percent agree to some level that this factor exists in the facility. However, 43.9% of the subjects disagree to some level that this factor is present. There is overwhelming agreement among the respondents (85.4%) that this factor impacts the learning environment at a moderate to significant level.

Figure 25 depicts the responses to statement 25: Science lab equipment has been updated less than five years ago to meet current standards.

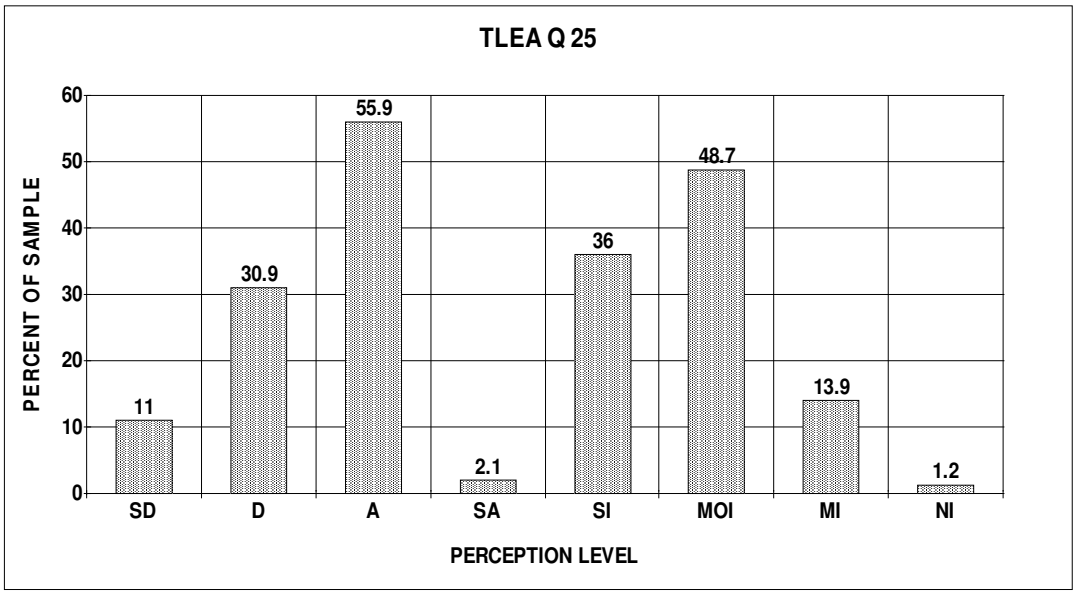

Figure 25: Science lab equipment has been updated less than five years ago to meet current standards.

Respondents disagree on the existence of this factor as well. Subjects disagree at a 41.9% level and agree at a 58% level that lab equipment is updated. They perceive at a very high percentage (84.7%) that this aspect moderately and significantly impact the learning environment.

Figure 26 depicts the responses to statement 26: Utilities such as gas, water, and electricity are available and are in usable condition in science labs.

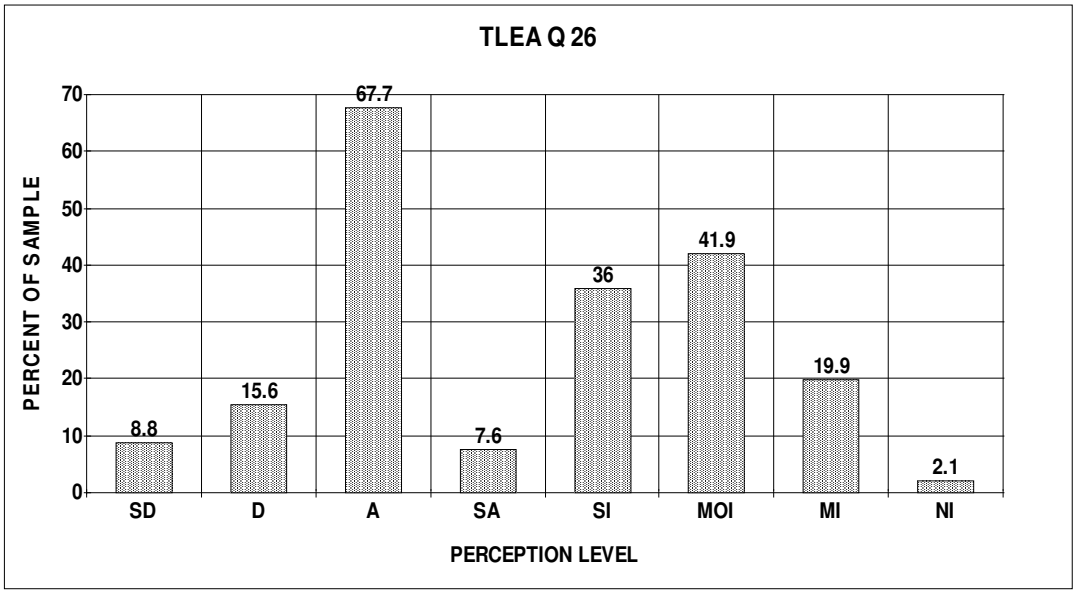

Figure 26: Utilities such as gas, water, and electricity are available and are in usable condition in science labs.

Respondents agree at a high percentage level (75.3%) that utilities are adequate. They also perceive that this aspect has a large impact on the learning environment.

Figure 27 depicts the responses to statement 27: Room design for technology education maximizes the of state of the art equipment.

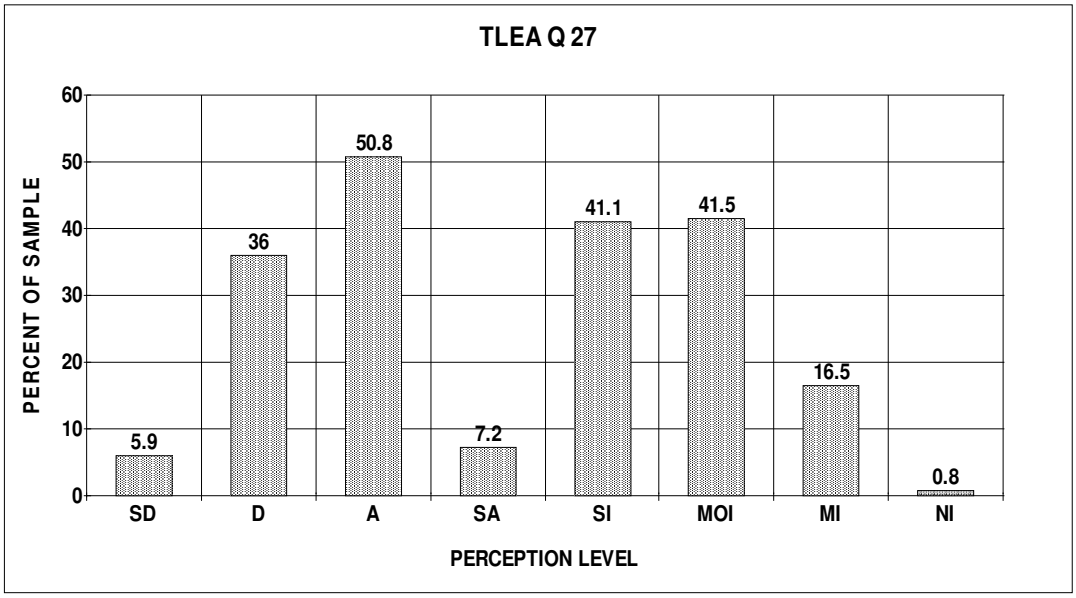

Figure 27: Room design for technology education maximizes the use of state of the art equipment.

Respondents are divided in their agreement on this factor. Fifty-eight percent agree that the use of state of the art equipment is maximized by technology room design. Respondents disagree at a 41.9% level that this factor exists in these rooms. There is very low disagreement on the perception of the impact that this factor has on the learning environment. Subjects perceived that this aspect has a significant and moderate impact on the learning environment at an 82.6% level. The Department of Commerce found that state of the art equipment in public school technology rooms such as educationally relevant digital equipment have the potential to change the learning environment and the teaching process. It was found that this focus can make the learning environment more flexible, engaging, and challenging for students. In nine years from 1994-2003, public schools in the United States have gone from 35% internet connectivity to 77%

connectivity. This requires current equipment to accomplish such a large increase. Technology is now commonly perceived as a tool for transformation of the learning environment in public schools (McMillan-Culp et al., 2003).

Figure 28 depicts the responses to statement 28: Space for small groups and remedial instruction is provided adjacent to the classrooms.

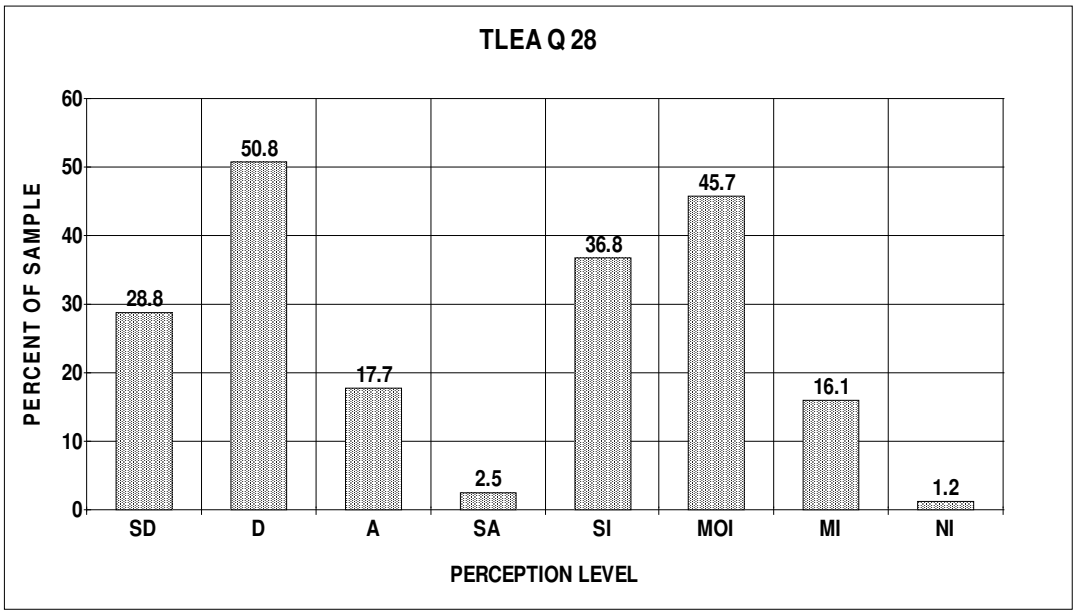

Figure 28: Space for small groups and remedial instruction is provided adjacent to the classrooms.

An interesting and atypical response to this statement is seen in figure 28. Respondents disagree and strongly disagree at a 79.6% level that space is provided adjacent to these classrooms for small group remedial instruction. This is important because it indicates that this factor is clearly inadequate and that respondents are aware that it is inadequate. They are also clear about their perception that this factor moderately and significantly

affects the learning environment. They perceive this effect at an 82.5% level. Lackney (1994a) and Black (2001) provide corroboration for this perception of the impact that small adjacent space has on the learning environment. Ideal classrooms must be flexible enough to provide small areas for learning and differing learning styles.

Figure 29 depicts the responses to statement 29: Academic team/department members occupy specific areas together within the school building or are organized by pods.

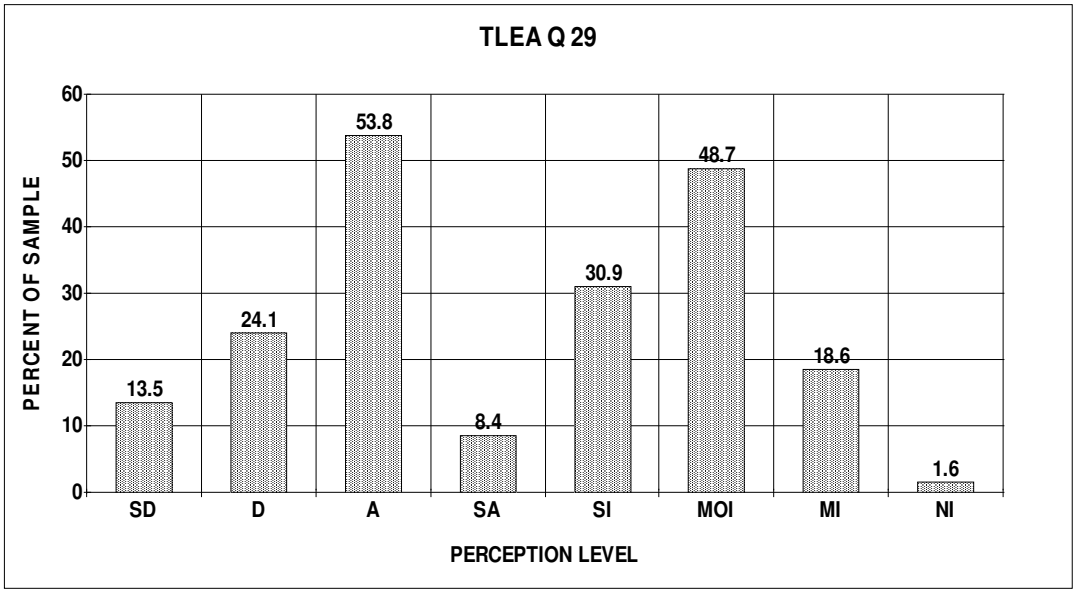

Figure 29: Academic team/department members occupy specific areas together within the school building or are organized by pods.

Respondents agree that this factor exists at a 62.2% level. However, there is disagreement at a 37.6% level. Subjects perceive this factor to have a significant and moderate impact at a 79.6% level. Lackney (1994b) refers to this arrangement as the

Team Suite/Cluster of Classrooms in his research on school design patterns. This design pattern is a reform pattern that allows teachers and students to work as a small community. This pattern is usually contained in a larger structure such as the school within a school design. This allows for more cooperative learning, facilitates small learning groups, and team activities. This pattern is supportive of the needs of the middle level customer (Finks, 2002).

Figure 30 depicts the responses to statement 30: The media center is well equipped with computers.

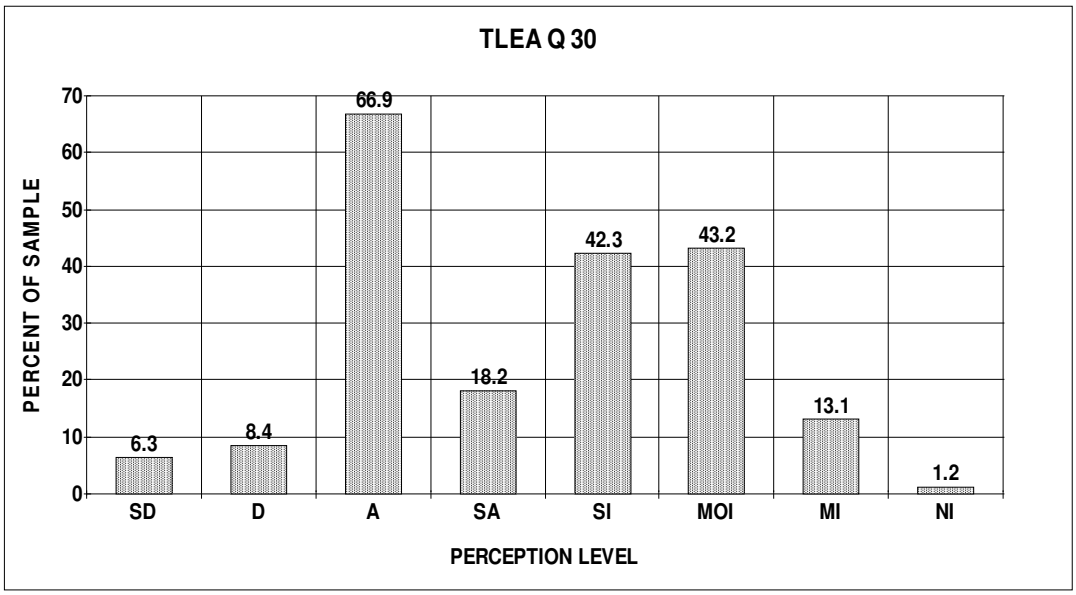

Figure 30: The media center is well equipped with computers.

Current architectural and construction trends suggest a movement away from a full sized media center equipped with a full suite of computers. Districts are now moving towards computers in every classroom and the laptop is diminishing the need for media centers

as computer hubs. Media centers are currently considered activity centers which support small student groups and project work (Dolan, 2004). Kolleeny (2005) corroborates this trend in saying that libraries/media centers have morphed over time into areas for collaborative and interactive learning meant to support student project work. Respondents agree that their media centers are well equipped at an 85.1% level. Equally, they perceive this factor to have a significant and moderate impact on the learning environment at an 85.5% level.

Figure 31 depicts the responses to statement 31: There are conference areas available for things such as team/department meetings, parent conferences, or faculty planning sessions.

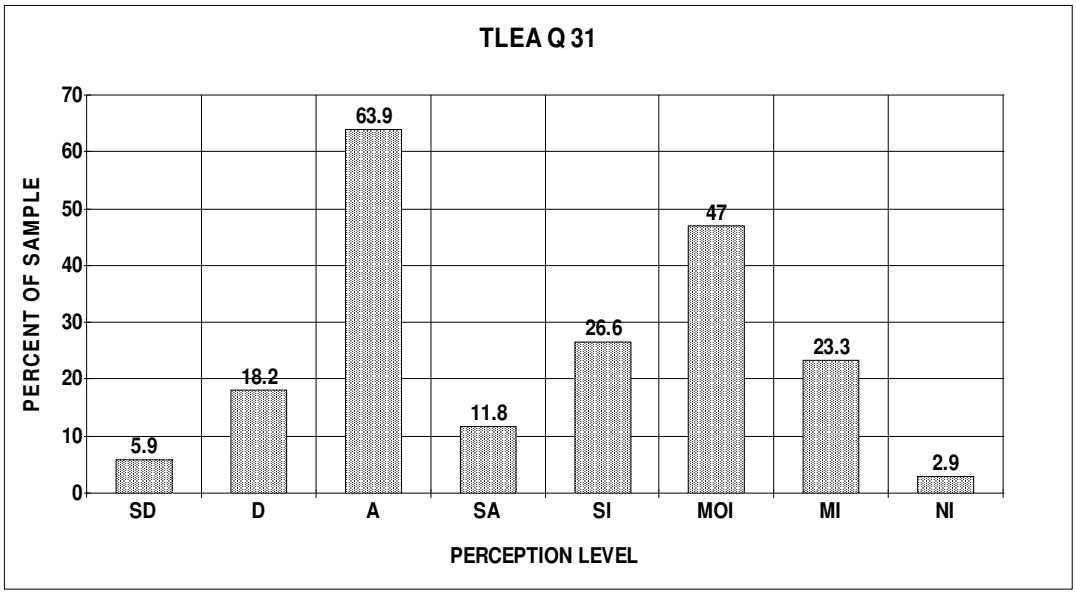

Figure 31: There are conference areas available for things such as team/department meetings, parent conferences, or faculty planning sessions.

Respondents agree at a 75.7% level that conference areas are available in their facilities. They also perceive that this aspect has a significant and moderate impact on the learning environment at a 73.6% level. A small portion of respondents perceive this aspect as having minimal or no impact on the learning environment (26.2%). This significant level of agreement is aligned with Lackney's (1994a) research which found that collaborative planning areas within a "team suite" are conducive to more adequate and high quality educational facilities.

Figure 32 depicts the responses to statement 32: Teacher's lounge and work areas support teachers as professionals. This marks the beginning of the Specialized Learning Spaces queries in the survey.

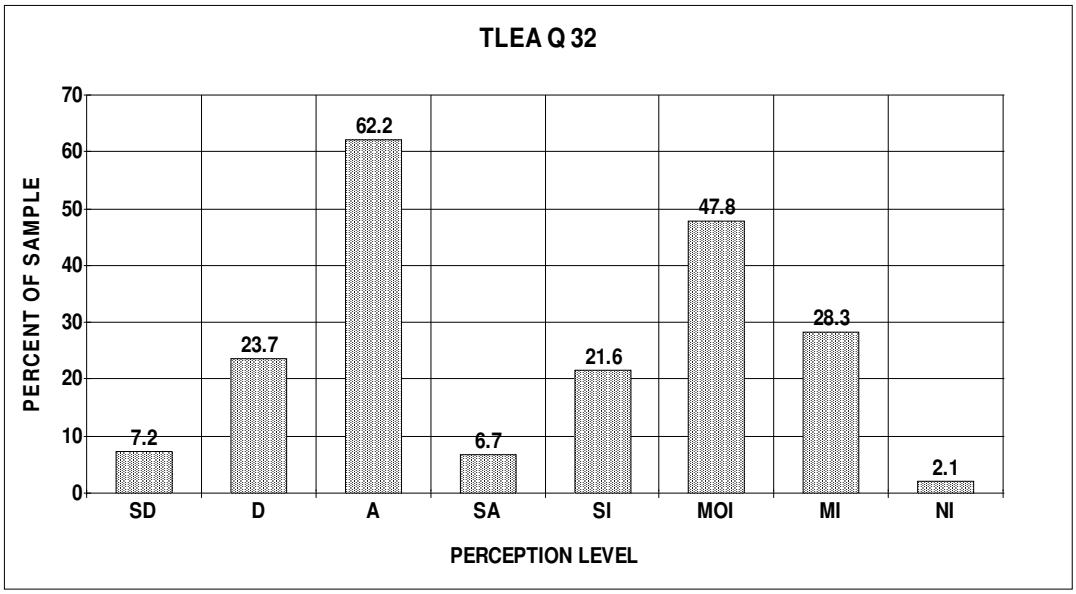

Figure 32: Teacher's lounge and work areas support teachers as professionals.

Research on facilities and the learning environment suggest an important connection between student learning and the manner in which quality professional space is provided to teachers. The amount of space and how it is furnished contributes to the instructional process (Hawkins and Lilley, 1998). Well designed and equipped teacher workspaces have the potential to enhance communication among teachers, promote professionalism, and increase the effectiveness of teacher lesson planning. Professional learning communities, networking, and collaboration is fostered by high quality teacher workspaces (Butin, 2000b). Respondents agree that this factor exists at a 68.9% level. There is a disagreement at a 30.9% level that this factor exists. Subjects perceive at a 69.4% level that this factor significantly and moderately impacts the learning environment. There is a similar level of disagreement in this perception at a 30.4% level. Respondents perceive minimal to no impact of teacher workspaces on the learning environment.

Figure 33 depicts the responses to statement 33: Cafeteria/kitchen is attractive with sufficient space for seating/dining, delivery, storage and food preparation.

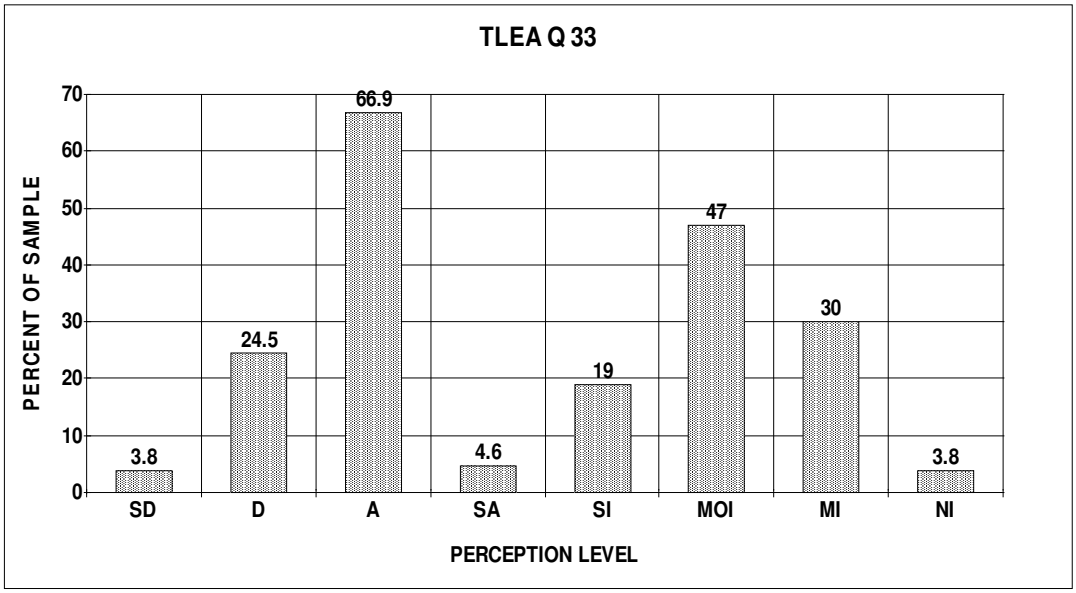

Figure 33: Cafeteria/kitchen is attractive with sufficient space for seating/dining, delivery, storage and food preparation.

At the middle school level as with other levels, the cafeteria may serve as a multi-purpose facility or cafetorium. These facilities should have a non-institutionalized environment to promote an inviting atmosphere (Hawkins and Lilley, 1998). While this aspect is important to customer comfort, it is not a major impacting factor on the educational adequacy, quality, and learning environment in the facility. Respondents agree and strong agree at a 71% level that their dining facilities are attractive and spacious. Subjects are not in agreement that this aspect has an impact on the learning environment. They perceive a significant and moderate impact at a 66% level and minimal or no impact at a 33.8% level. This is representative of the impact that this factor has on the learning environment suggested in the research.

Figure 34 depicts the responses to statement 34: Administrative offices are consistent in appearance and function with the maturity of students served

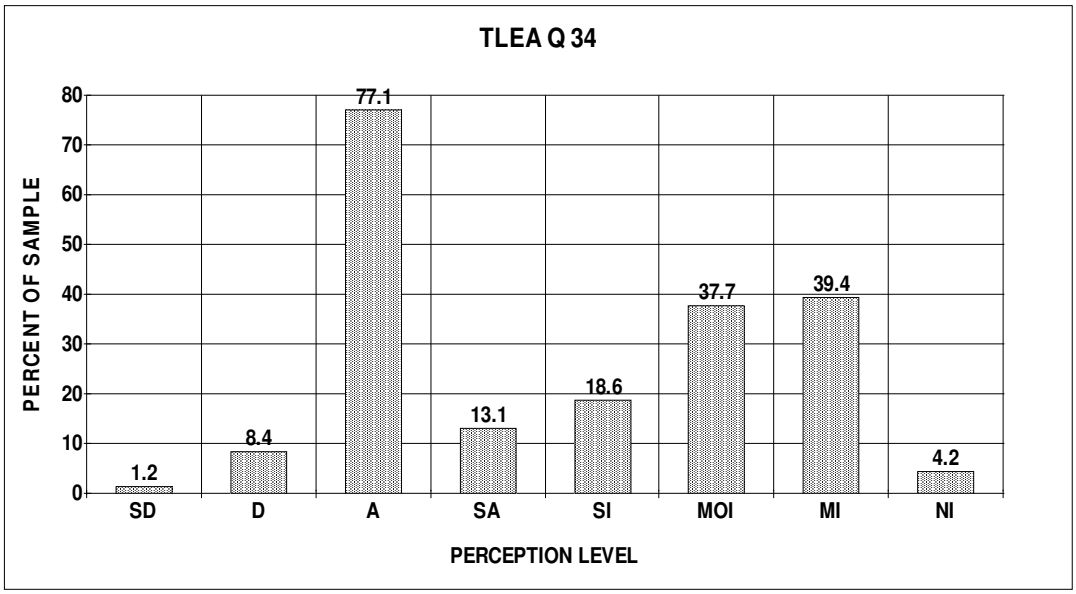

Figure 34: Administrative offices are consistent in appearance and function with the maturity of students served.

Respondents overwhelmingly agree at a 90.2% level that this factor is present in their facilities. When asked their perception of the impact that this factor has on the learning environment, respondents are in disagreement. Fifty-six point three percent perceive a significant to moderate impact on the learning environment. Subjects perceive that this factor has minimal or no impact on the learning environment at a 43.6% level. At the secondary level this area of the school should be larger than elementary schools and will have signage indicating such functions as student attendance, admissions, registration, and administrative staff. The administrative office sets the tone for the appropriate

operation of the building (Hawkins and Lilley, 1998). It is important that the needs of the middle level student are met here. In this setting, the child must be the focal point as opposed to the school programs (Finks, 1990).

Figure 35 depicts the responses to statement 35: Counselor's office ensures privacy and sufficient storage.

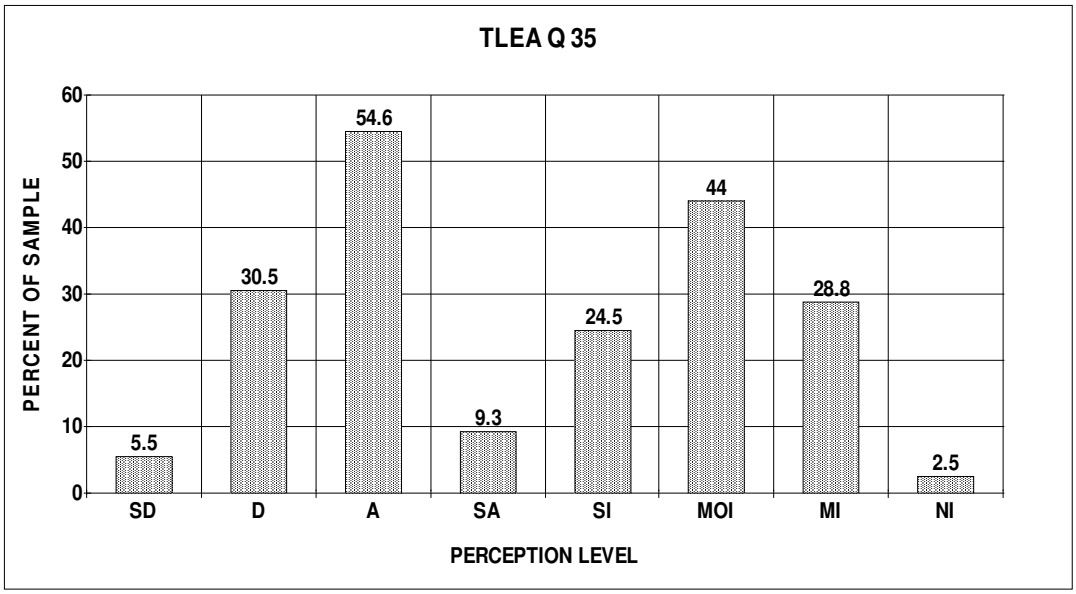

Figure 35: Counselor's office ensures privacy and sufficient storage.

At the middle school level, full-time personnel occupy this space. A reception area and one or more counselor offices is essential. A conference room and storage for materials and supplies will complete the requirement for this area (Hawkins and Lilley, 1998). Respondents agree and strongly agree at a 63.9% level that these conditions exist in the counseling offices. A significant percentage (36%) of subjects disagrees to some level that these conditions exist in the counseling offices. The counseling offices are not areas

frequented by subjects and therefore they may disagree because they do not know the conditions or they may disagree because they know these spaces well enough to judge them accurately. Respondents perceive at a 68.5% level that these conditions significantly or moderately affect the learning environment. Respondents perceive minimal or no impact on the learning environment at a 31.3% level.

Figure 36 depicts the responses to statement 36: Clinic is near or can communicate with administrative offices and is equipped to meet requirements.

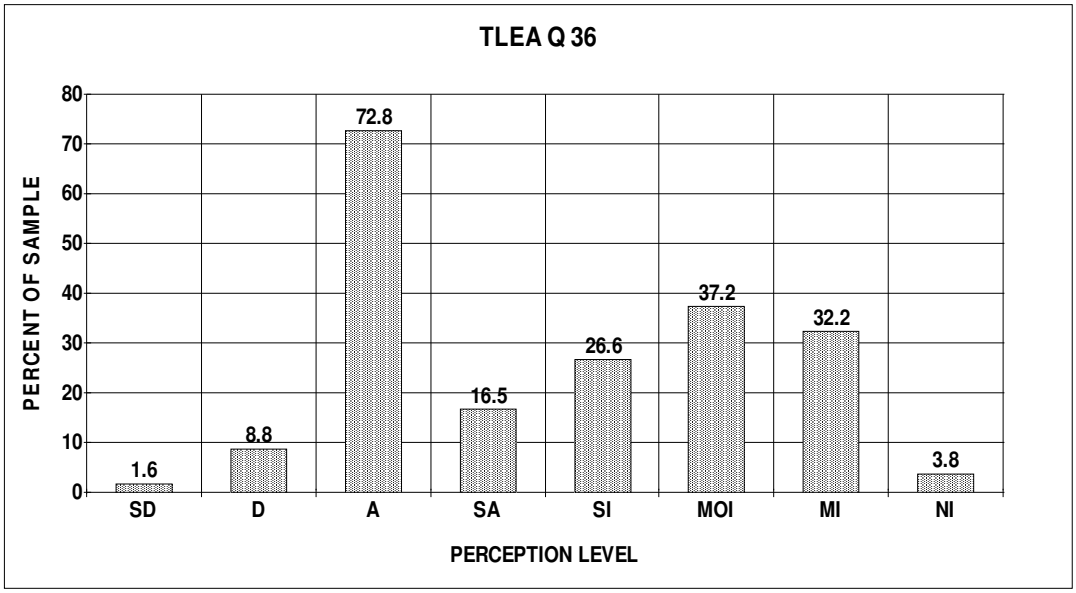

Figure 36: Clinic is near or can communicate with administrative offices and is equipped to meet requirements.

The clinic regardless of grade level is generally located near the principal's office area. This is appropriate in schools with modest enrollment where diversified personnel are not available. Restrooms, water, and privacy are essential for an adequate clinic area

(Hawkins and Lilley, 1998). Educational research shows that there is a strong relationship between a student's physical well being and his or her academic achievement. The school clinic/health center is an integral part of the school mission to foster academic achievement and to provide a positive learning environment (Butin, 2000a). Respondents agree and strongly agree that these conditions exist in their clinics at a significant 89.3% level. They are not in full agreement that this aspect impacts the learning environment. Sixty-three point eight percent of subjects perceive a significant to moderate impact and 36% perceive minimal or no impact on the learning environment.

Figure 37 depicts the responses to statement 37: Administrative personnel are provided sufficient work space and privacy.

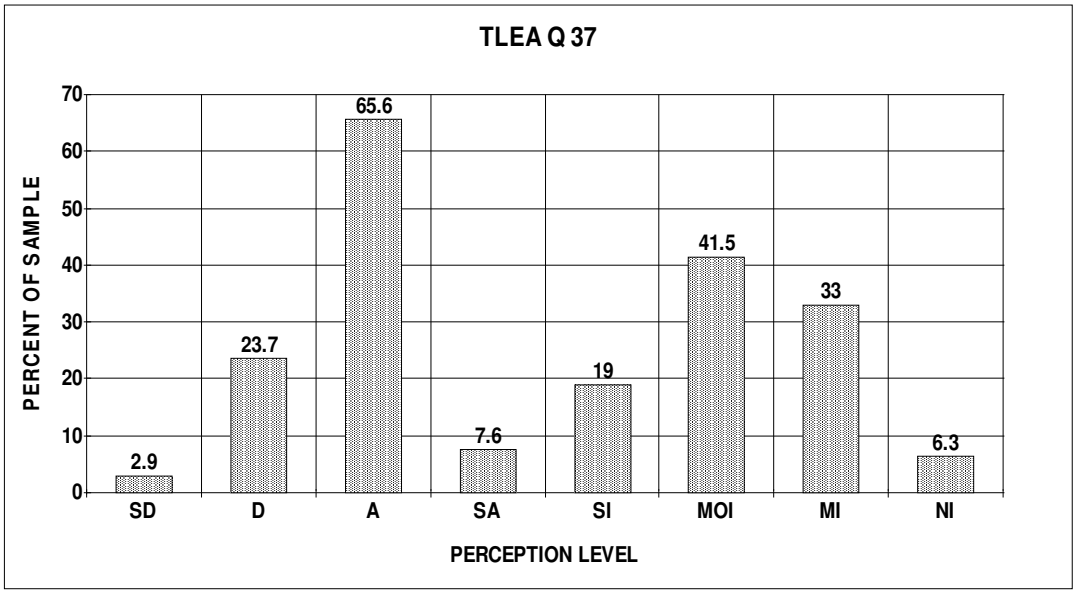

Figure 37: Administrative personnel are provided sufficient work space and privacy.

Respondents agree at a 73% level that these factors exist in administrative areas. They perceive a significant to moderate impact at a 60.5% level and moderate to no impact at a 39.3% level.

Figure 38 depicts the responses to statement 38: Teachers have their own office space (apart from the classroom) with access to telephones and computers.

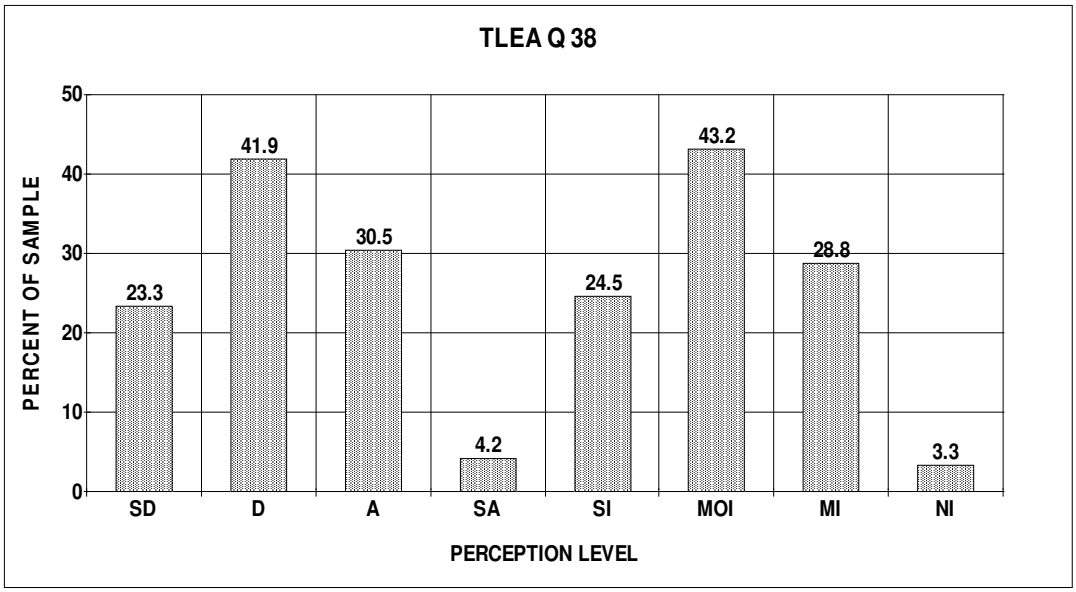

Figure 38: Teachers have their own office space (apart from the classroom) with access to telephones and computers.

Teacher workspaces should be considered a critical element in the success of the academic program of the school. Without adequate professional space, teacher preparation and innovation, and the learning environment may be negatively affected. In schools today, a teacher's classroom is commonly not his or her own as it was in the past. It may be used by two or three teachers who migrate between several classrooms

in the course of a day. The office-based workspace becomes a home base for many teachers who need a permanent place to plan and prepare. Office-based workspace design is influenced by the move toward alternative school schedules and the professionalization of teaching. These generally include private offices, teacher workroom with workstations, break-room, conference room, lounge, and restrooms. Private offices may be used for one-on-one meetings, parent conferences, and consultations and should provide adequate space to facilitate such interactions. This private space facilitates interaction and collaboration among teacher teams, and departments, and fosters the perception of a professional learning community among teacher colleagues (Butin, 2000b). The amount of space, furnishings, access to supplies and the overall quality of teacher office spaces indicates to teachers their level of importance in the learning environment (Hawkins and Lilley, 1998). The respondents to this statement disagree and strongly disagree that this condition exists in their facilities. The subjects indicate significantly at a 65.2% level that these factors do not exist. A small percentage (34.7%) agrees that these factors exist in their facilities. Similar percentages (67.7%) perceive that this factor impacts the learning environment at a significant and moderate level. This aligns with the research by Hawkins and Butin that suggests an important linkage between student learning and the manner to which professional space is provided to teachers. A small percentage of subjects perceives that this factor has minimal or no impact on the learning environment.

Figure 39 depicts the responses to statement 39: School facility has a teacher professional library that is accessible as well as current.

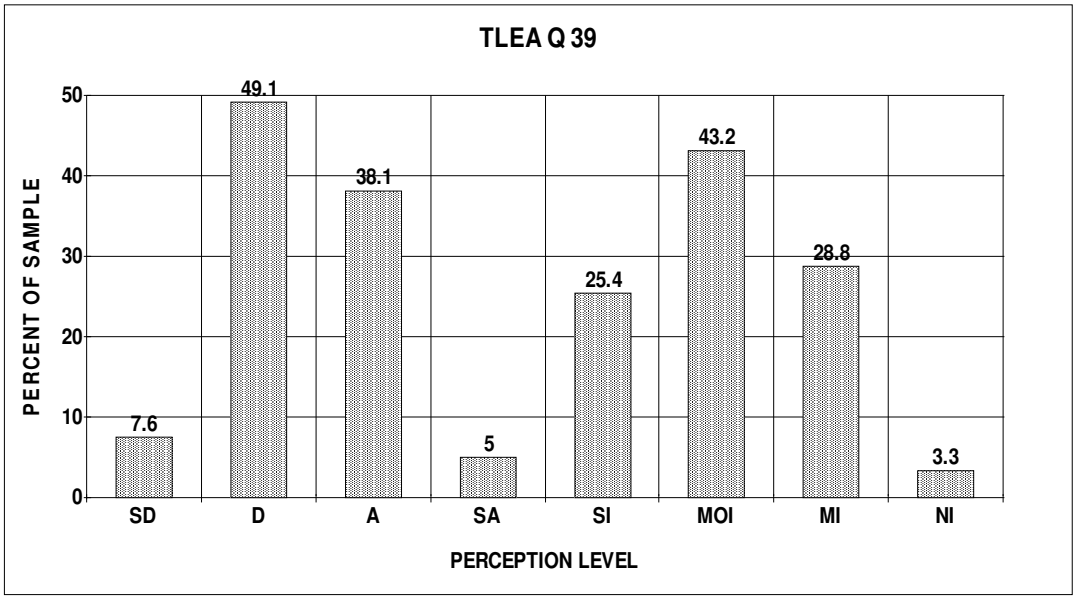

Figure 39: School facility has a teacher professional library that is accessible as well as current.

Respondents disagree that this factor exists at a 56.7% level and agree that is exists at a 43.1% level. They perceive that this has a significant to moderate impact on the learning environment at a 68.6% level.

Figure 40 depicts the responses to statement 40: The school facility permits teachers to function as professionals.

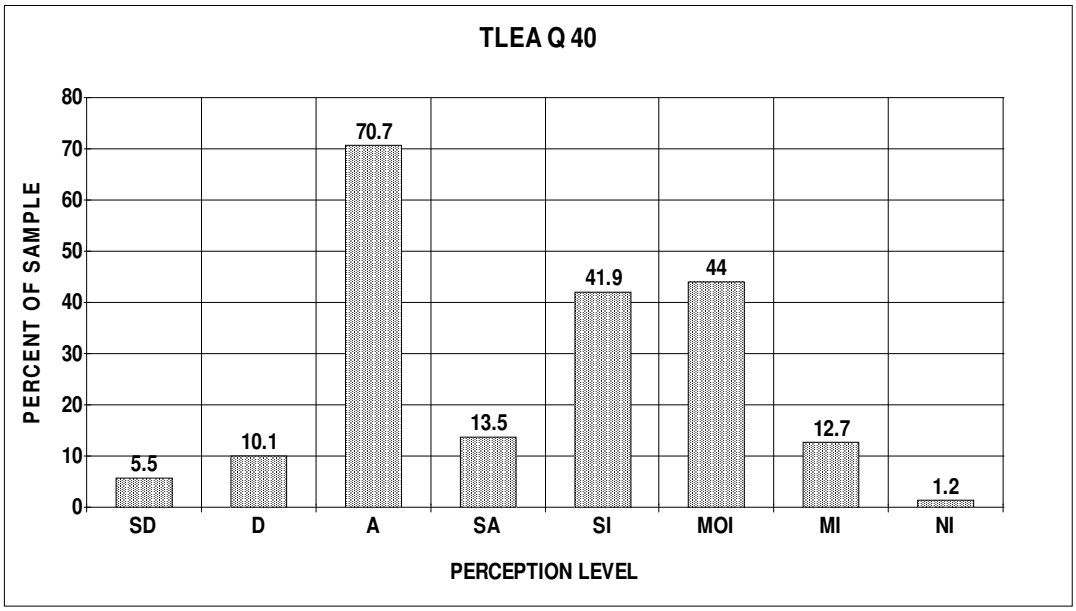

Figure 40: The school facility permits teachers to function as professionals.

Subjects agree at a significant level (84.2%) that this environment exists in their facility. They perceive at a significant level (85.9%) that this factor impacts the learning environment.

Figure 41 depicts the responses to statement 41: Teacher parking is convenient and sufficient to accommodate building staff and campus visitors.

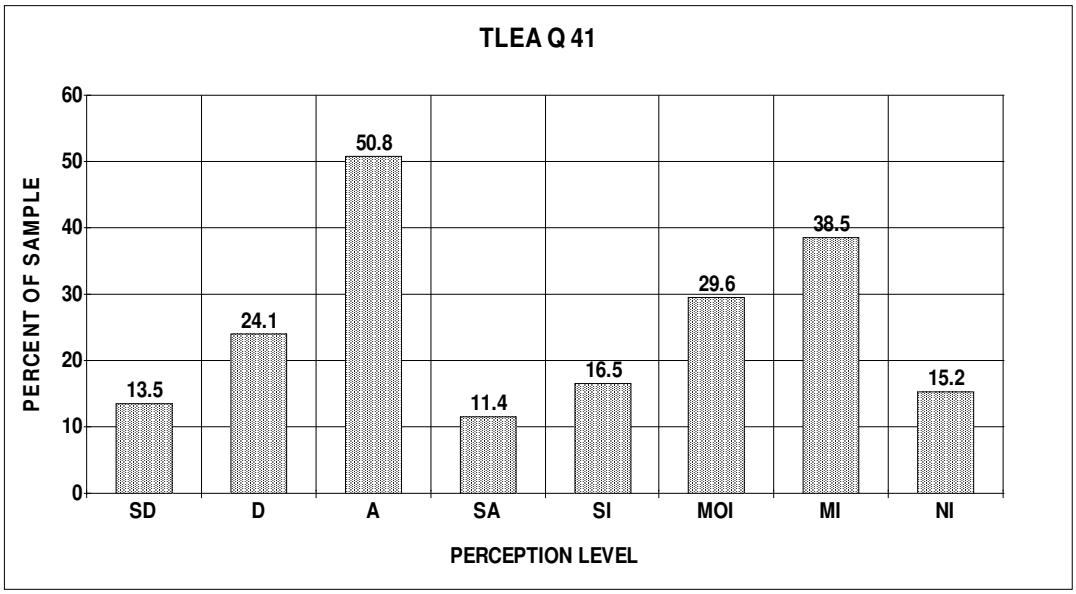

Figure 41: Teacher parking is convenient and sufficient to accommodate building staff and campus visitors.

Respondents agree at a 62.2% level that sufficient parking exists at their facilities. Appropriately, they perceive that this factor has minimal or no impact on the learning environment at a 53.7% level.

Figure 42 depicts the responses to statement 42: Suitable reception space is available for students, teachers, and visitors so they feel welcome. This marks the beginning of the Community and Parent Space queries in the survey.

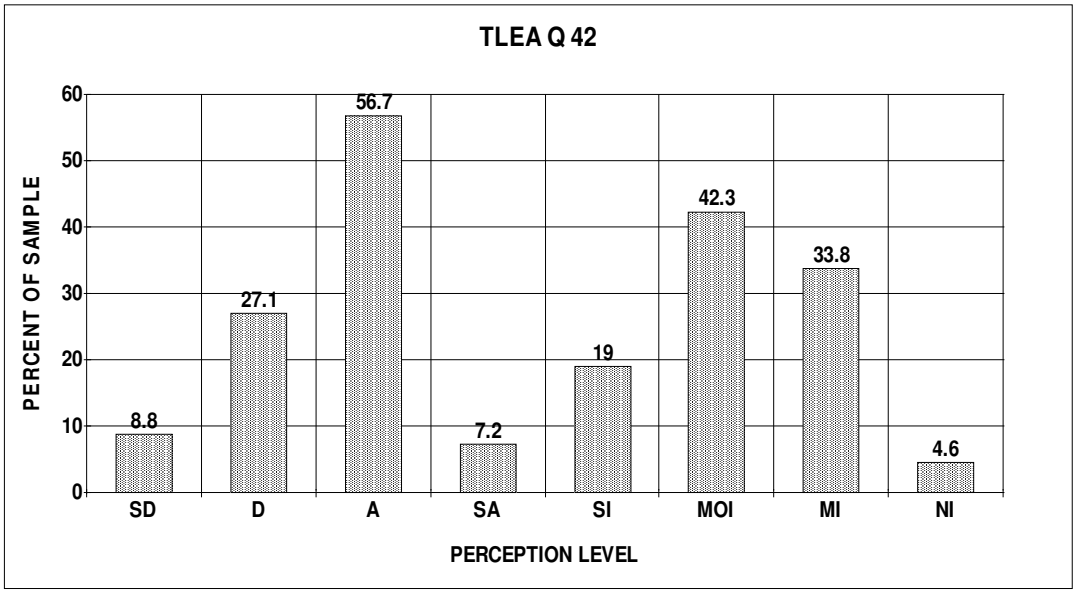

Figure 42: Suitable reception space is available for students, teachers, and visitors so they feel welcome.

Respondents agree at a 63.9% level that suitable reception space is available in their facilities. Respondents disagree at a 35.9% level that this factor exists in their facilities. Subjects perceive that this factor has a significant to moderate impact on the learning environment at a 61.3% level. A smaller percentage (38.4%) perceives that this factor has minimal or no impact on the learning environment. Minnigan (2002) suggests that the entryway or reception space in schools say a lot about the learning environment of the school. These spaces also set the tone of the receptiveness in the school.

Figure 43 depicts the responses to statement 43: The school building has meeting rooms for parents and/or offices for volunteers and volunteer coordinators.

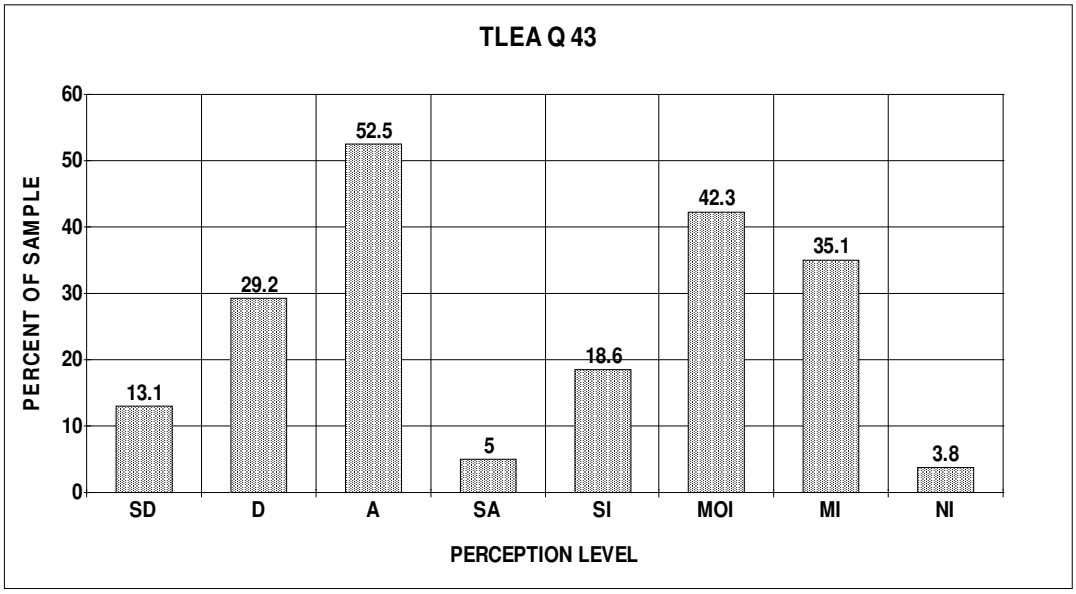

Figure 43: The school building has meeting rooms for parents and/or offices for volunteers and volunteer coordinators.

Respondents agree at a 57.5% level that these factors exist in their facilities. They perceive that this factor has a significant to moderate impact on the learning environment at a 60.9% level.

Figure 44 depicts the responses to statement 44: The school facility is an integral part of the community in that it is utilized after school, evenings, and weekends.

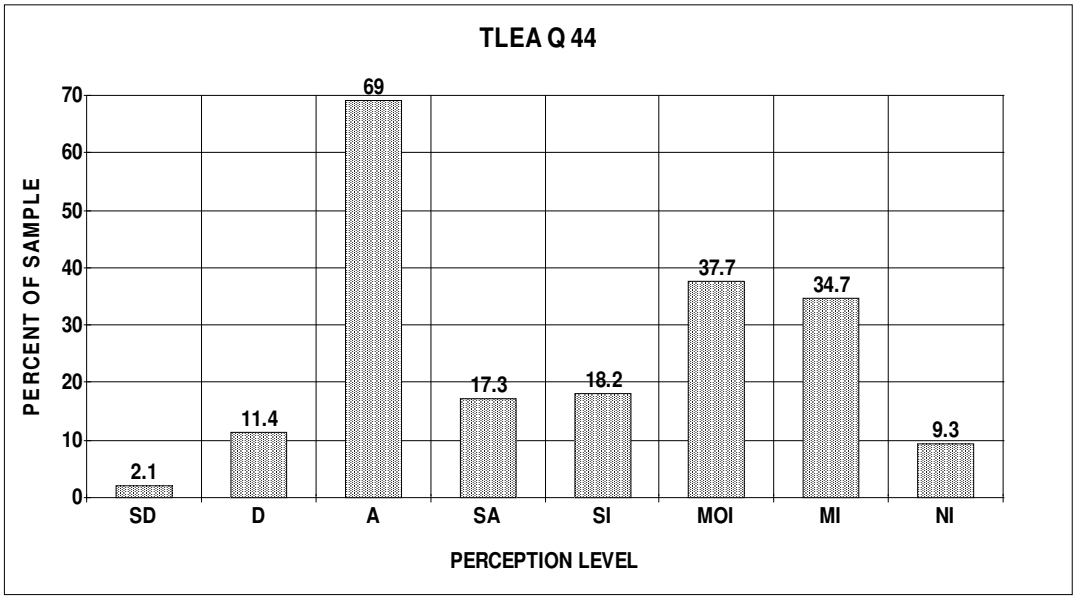

Figure 44: The school facility is an integral part of the community in that it is utilized after school, evenings, and weekends.

When school facilities accommodate a wide range of community activities outside normal school hours communities can create new opportunities for students, adults, and a wide variety of community members. Schools serving as centers of communities facilitate student learning, increase school effectiveness, and add vitality to the community. Ohio public schools have developed guiding principles for communities and schools to maximize student learning and achievement, and design schools to support learning. They found that when schools are an integral part of the community, deep rooted community engagement and support of the school and its activities were realized. They also discovered through this process of developing guiding principles for school design that learning is enhanced when facilities support a school's education program. When this education program includes flexible spaces for community use,

community, economic, and academic improvement are seen. In short, schools of the future must be high-quality facilities that support education programs that include community involvement, engagement, and usage. ("Knowledge Works", 2005). Humble ISD middle school educators agree at an 86.3% level that these factors exist in their facilities. They are divided on the impact that this has on the learning environment. Respondents perceive a significant to moderate impact on the learning environment at a 55.9% level. They perceive at a 44% level that this factor has minimal or no impact on the learning environment. While the research suggests that this factor impacts achievement and learning when properly designed, achievement is only a part of the learning environment. The learning environment is formed by the relationship between the architectural facility and the surrounding environment (Loughlin, 1982). The physical surroundings in the learning environment impact perceptual learning, concept formation, language development, socialization, creative growth, attitudes towards school, reduction of vandalism, and attrition rates in school (Lackney, 1999b).

Figure 45 depicts the responses to statement 45: The school building design incorporates community functions as a part of the normal operation of the school.

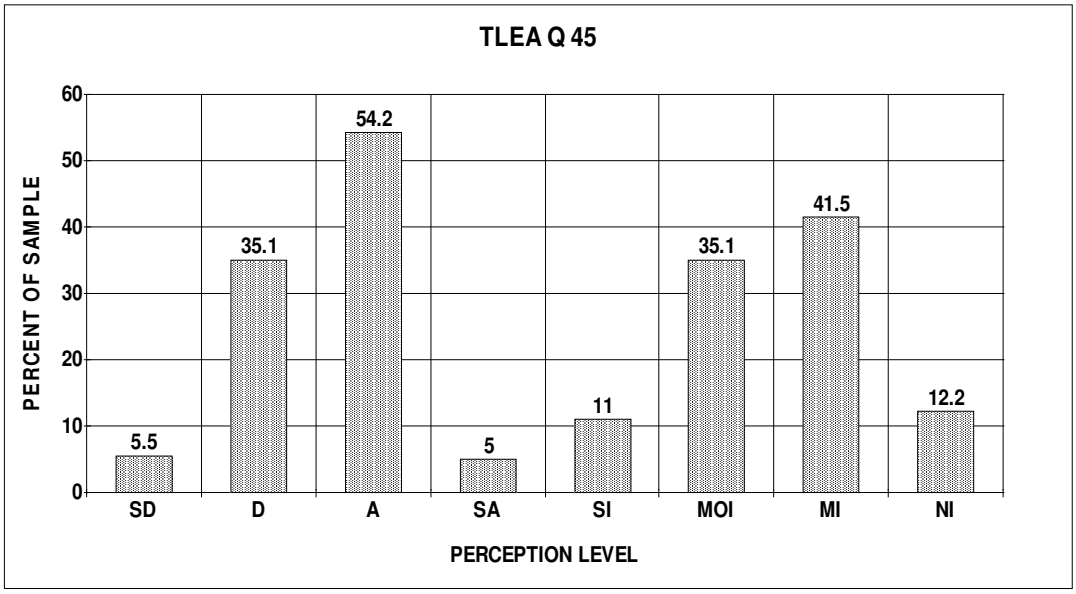

Figure 45: The school building design incorporates community functions as a part of the normal operation of the school.

Respondents agree at a 59.2% level that the school design incorporates community functions into the normal operation of the school. They disagree at a 41% level that this factor exists in their facilities. Respondents perceive that this aspect has minimal to no impact on the learning environment at a 53.7% level. They perceive that community functions in the facility have significant to moderate impact on the learning environment at a 46% level. Respondents perception of the low impact of this factor suggest that while research shows that it is important, building occupants and customers do not perceive it as critical to the learning environment.

Figure 46 depicts the responses to statement 46: Common space, classrooms, gymnasiums, cafeterias, library, media centers, computer labs, and performing arts centers are available and used by the community for non-educational purposes.

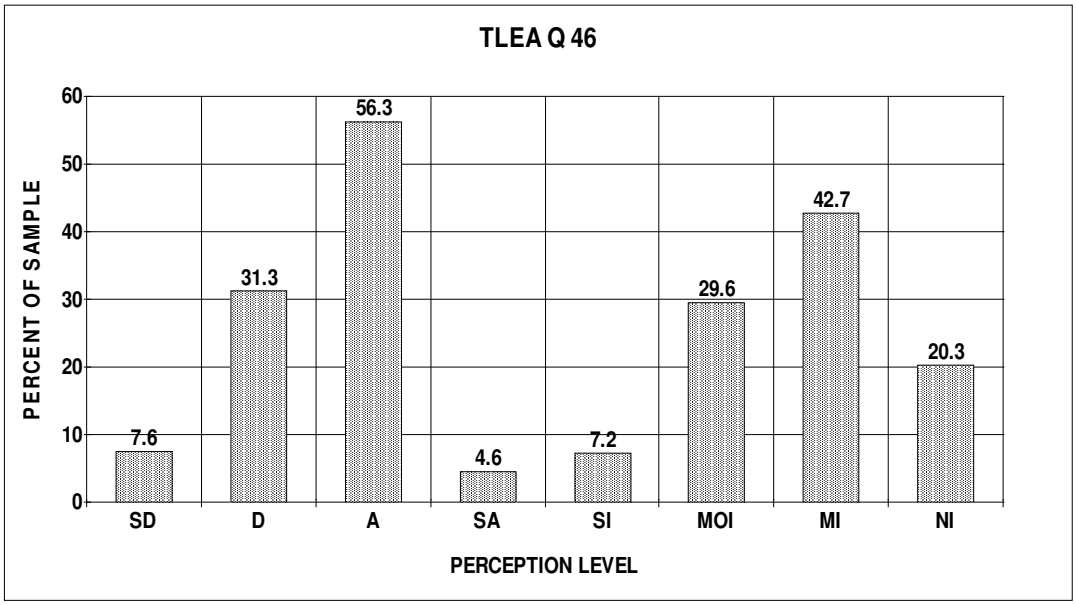

Figure 46: Common space, classrooms, gymnasiums, cafeterias, library, media centers, computer labs, and performing arts centers are available and used by the community for non-educational purposes.

Respondents agree that these activities take place in their facilities at a 60.9% level. They perceive that this has minimal or no impact at a 63% level.

Figure 47 depicts the responses to statement 47: Utilization of facility reflects community values.

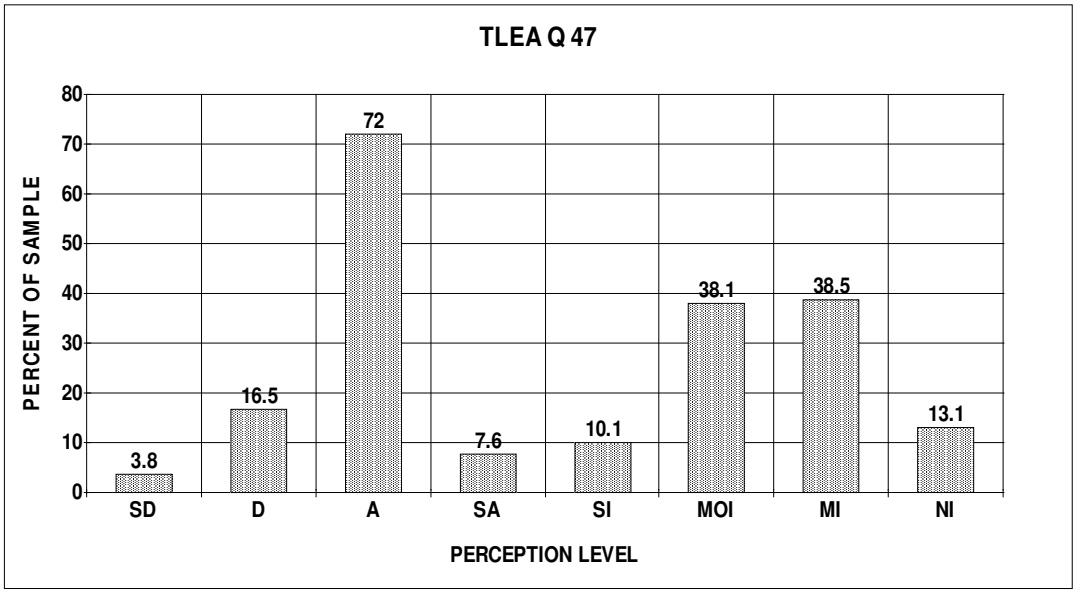

Figure 47: Utilization of facility reflects community values.

Respondents overwhelmingly agree at a 79.6% level that the utilization of their facility reflects community values. Forty-eight point two percent of respondents perceive that this has a significant to moderate impact on the learning environment and 51.6% perceives minimal or no impact.

Figure 48 depicts the responses to statement 48: Overall design is aesthetically pleasing and appropriate for the age of the students. Statement 48 marks the beginning of the Environment for Education section of this survey and Exterior Environment queries.

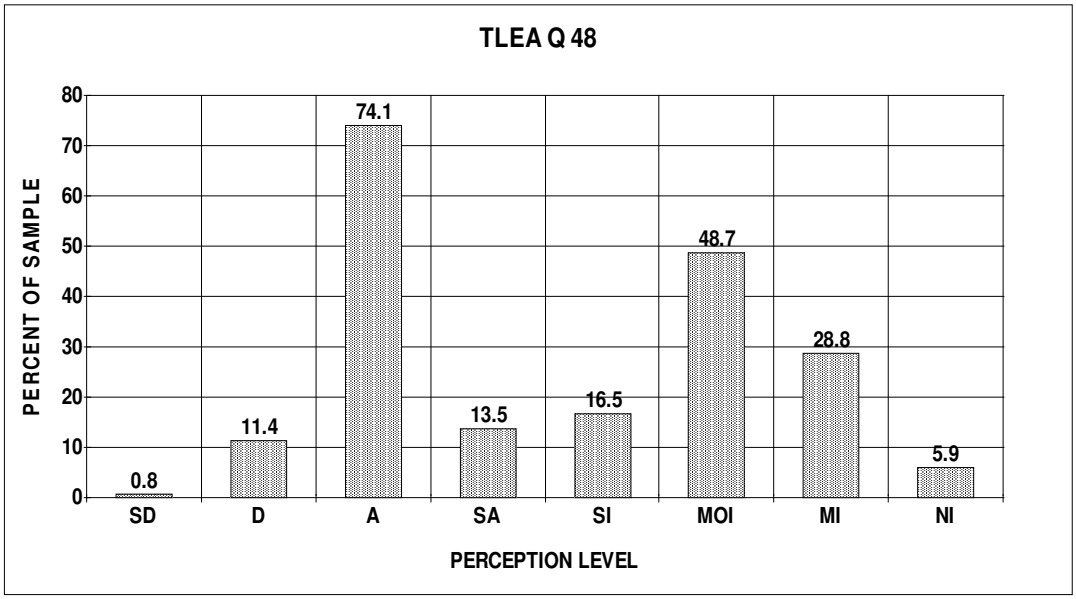

Figure 48: Overall design is aesthetically pleasing and appropriate for the age of the students.

The design of a school is most pleasing when it blends with the surrounding physical environment. Building designers must fit the building into its surroundings. Placement of the building on the site and orientation on the site will affect the initial reaction to the facility. The elevation of the building is a factor in the general appearance of the facility and is best when placed higher than the surrounding street (Hawkins and Lilley, 1998). Respondents agree overwhelmingly that their facility is aesthetically pleasing and age appropriate. They perceive that this has a significant to moderate impact at a 65.2% level and moderate to no impact at a 34.7% level.

Figure 49 depicts the responses to statement 49: Exterior noise and surrounding environment do not disrupt learning

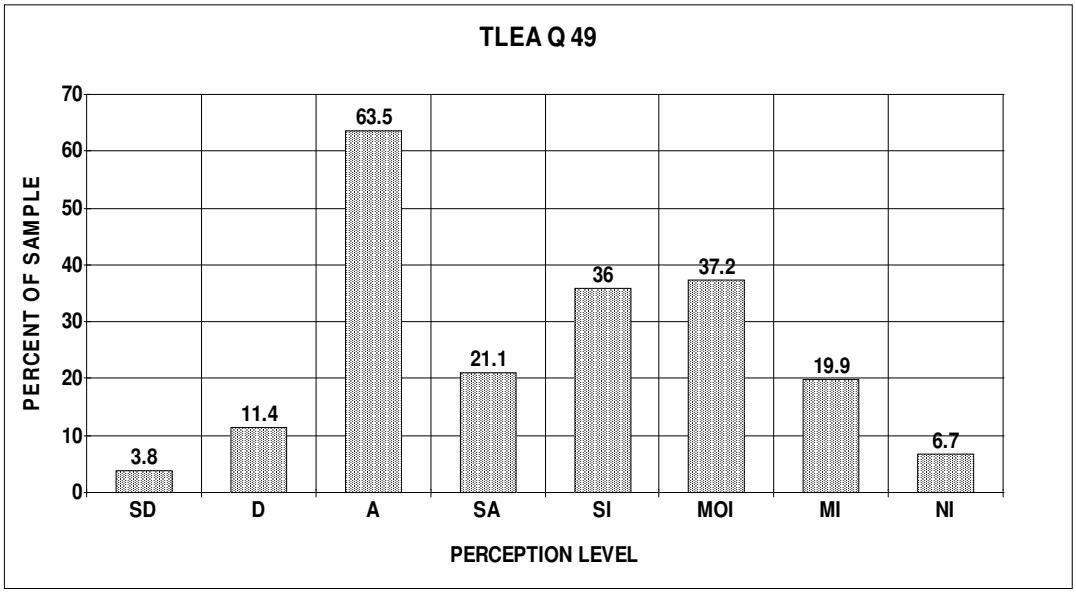

Figure 49: Exterior noise and surrounding environment do not disrupt learning.

Acoustical treatment of the facilities and noise distraction clearly impacts the learning environment. Basic guidelines have been set for acoustical treatment in schools. The Architecture and Transportation Compliance board and the Acoustical Society of America have set limits for background noise at 35 decibels in schools (Schneider, 2002). Student achievement is significantly correlated to disruptive noises both externally and internally. The location of the learning environment is critical to minimizing these distracting factors (O'Neill, 1999). Respondents agree at a high level (84.6%) that noise does not disrupt the learning in their facilities. Subjects' perceptions correlate directly with research on the high impact that noise has on the learning environment. Respondents perceive that noise has a significant to moderate impact on the learning environment at a 73.2% level.

Figure 50 depicts the responses to statement 50: Entrances and walkways are sheltered from sun and inclement weather.

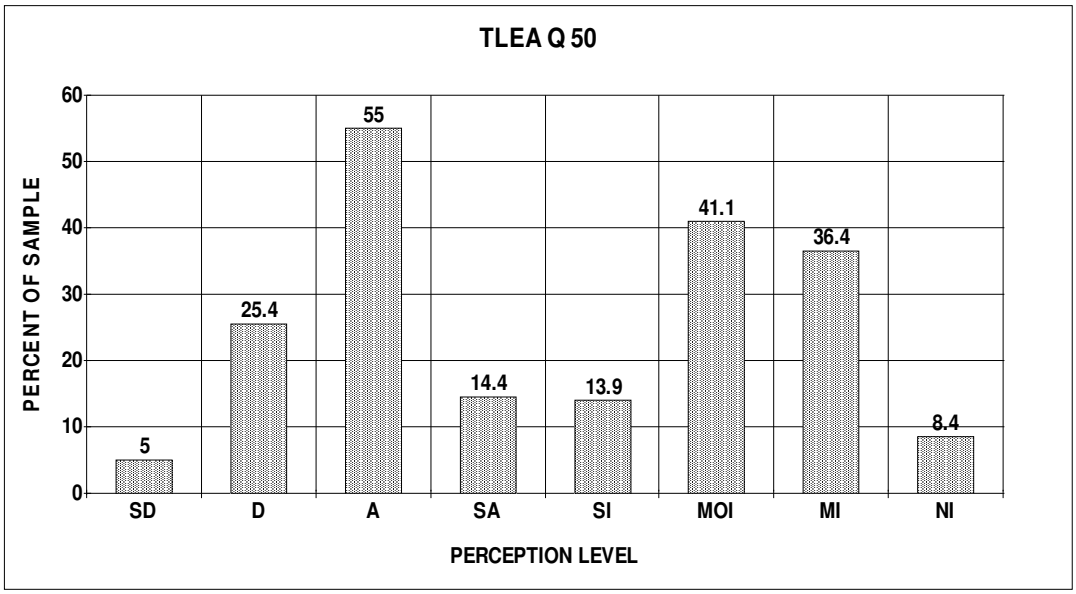

Figure 50: Entrances and walkways are sheltered from sun and inclement weather.

Protection from the elements is essential for educational adequacy and high quality public school facilities. Waiting for a building to open and waiting for buses mandates shelter from precipitation in most parts of the country. In this section of the country it is helpful to have covered walkways for shade. These features compliment a facility, provide convenience for the users, and present a favorable environment for the community (Hawkins and Lilley, 1998). Respondents agree at a 69.4% level that these features exist at their facilities. They disagree that they exist at a 30.4% level. Subjects perceive that this aspect has a significant to moderate effect on the learning environment at a 55% level. They perceive minimal to no impact on the learning environment at a

44.8% level. This split in perception of the impact that this factor has on the learning environment suggests that respondents see this factor as less critical to the learning environment than other factors.

Figure 51 depicts the responses to statement 51: Building materials provide attractive color and texture.

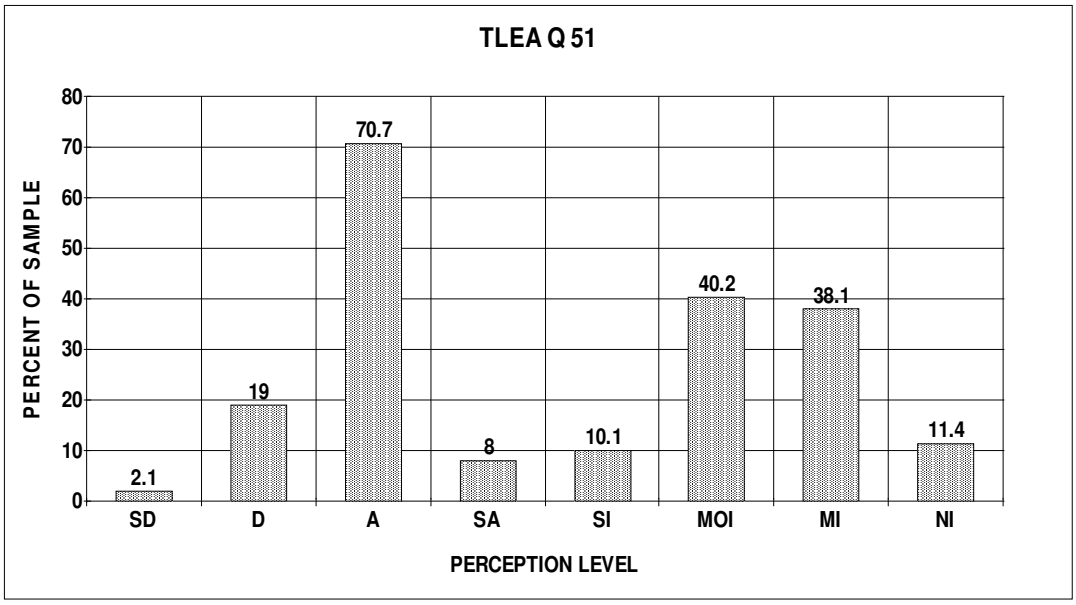

Figure 51: Building materials provide attractive color and texture.

Whether schools are constructed of wood, concrete, cement block, or brick, the learning environment is affected by the type of material used and the texture of these materials. School facilities often utilize several different external materials to enhance the appearance of the building. The building should provide psychological warmth through the proper and thoughtful use of color and texture (Hawkins and Lilley, 1998). In warm climates, these factors should be used to optimize a cooling feel to the building.

Subjects agree at 78.7% level that their facilities are attractive in color and texture. Respondents are divided on their perception of the level to which this factor impacts the learning environment. They perceive that attractive color and texture significantly and moderately impact the learning environment at a 50.3% level. Subjects perceive minimal or no impact on the learning environment at a 49.5% level.

Figure 52 depicts the responses to statement 52: Proper maintenance (exterior) of the school facility is a priority and vandalism and/or graffiti are repaired/removed quickly

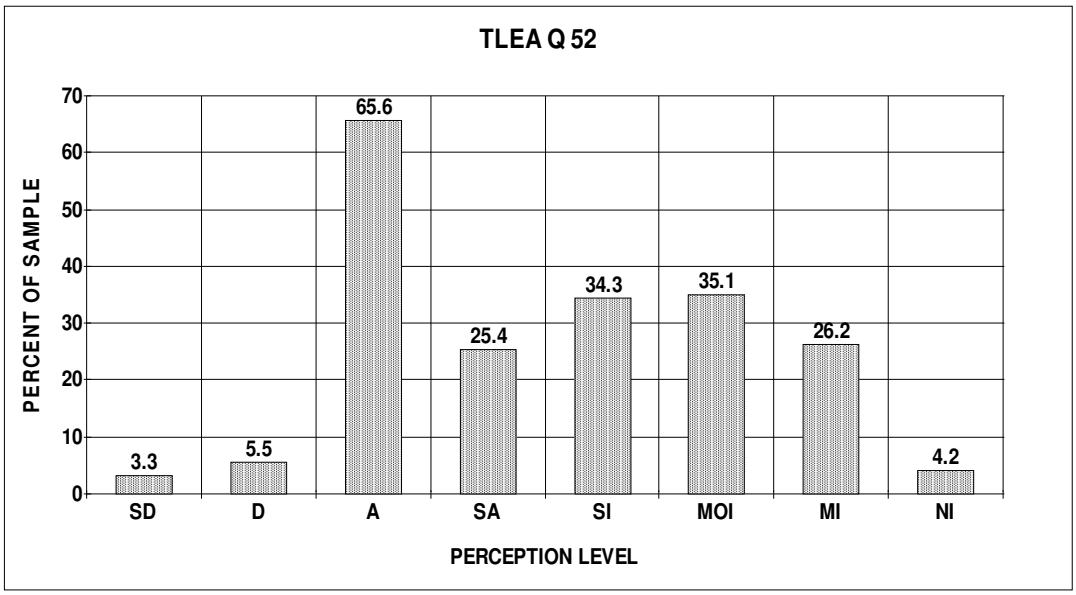

Figure 52: Proper maintenance (exterior) of the school facility is a priority and vandalism and/or graffiti are repaired/removed quickly.

Buildings must be maintained as nearly as possible in their original state. Normal wear, time, and the elements will cause deterioration which can be lessened by effective

maintenance of the building envelope. Maintainability results from the level of building quality designed into the school when it was originally built (Hawkins and Lilley, 1998). Deferred maintenance of the building envelope will lead to the deterioration of the structure. Deteriorating facilities will tax district budgets but more importantly, poorly maintained buildings have a stronger impact on student performance and the learning environment than money, family, socioeconomic status, attendance and behavior. A positive learning environment is conducive to productive students, teachers, and communities (Gould, 2005). Respondents overwhelmingly agree that proper school maintenance exists at a 91% level. They are again mixed on their perception of the impact that maintenance has on the learning environment. They perceive a significant to moderate impact at a 69% level and minimal or no impact at a 30.4% level.

Figure 53 depicts the responses to statement 53: Site and building are well landscaped.

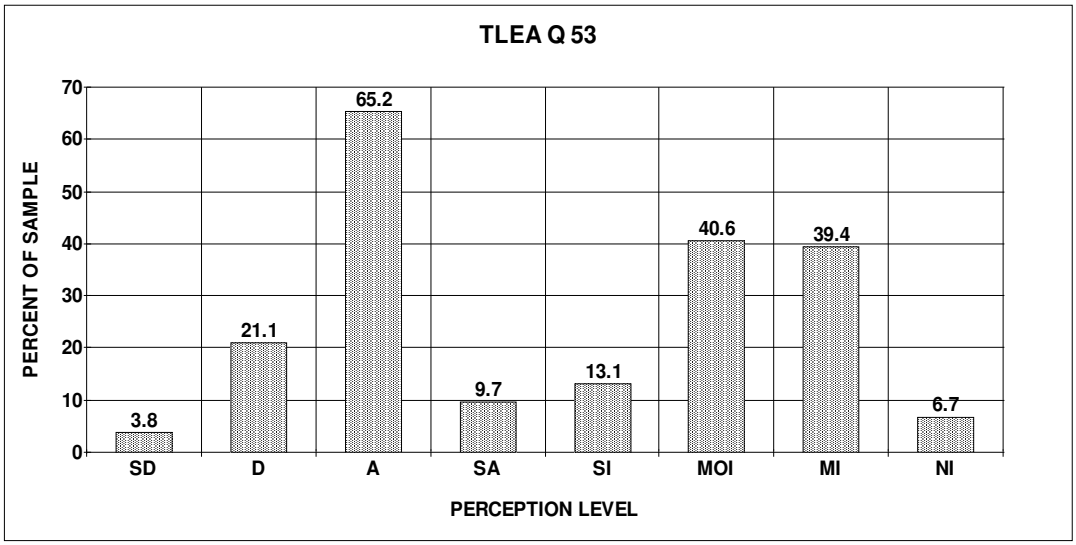

Figure 53: Site and building are well landscaped.

Most importantly, a school building is one of the most effective public relations tools. The image of the school must be a positive one for those who attend, work, and utilize the building and should appear attractive to those passing by. Landscaping is a critical part of that image and can be an asset to every school facility. The school site should support plant life, natural vegetation, and trees with minimal effort. Ideally, proper landscaping should create a park-like appearance throughout the grounds. However, landscaping elements must be easily maintained to reduce deterioration. Proper design and care of the exterior grounds and appearance pays dividends to the school, community and the learning environment. Respondents agree at a 74.9% level that this factor exists. They perceive a significant to moderate impact on the learning environment at a 53.7% level and minimal or no impact at a 46.1% level.

Figure 54 depicts the responses to statement 54: Exterior walls, or windows and trim were painted fewer than 5 years ago or are in excellent condition.

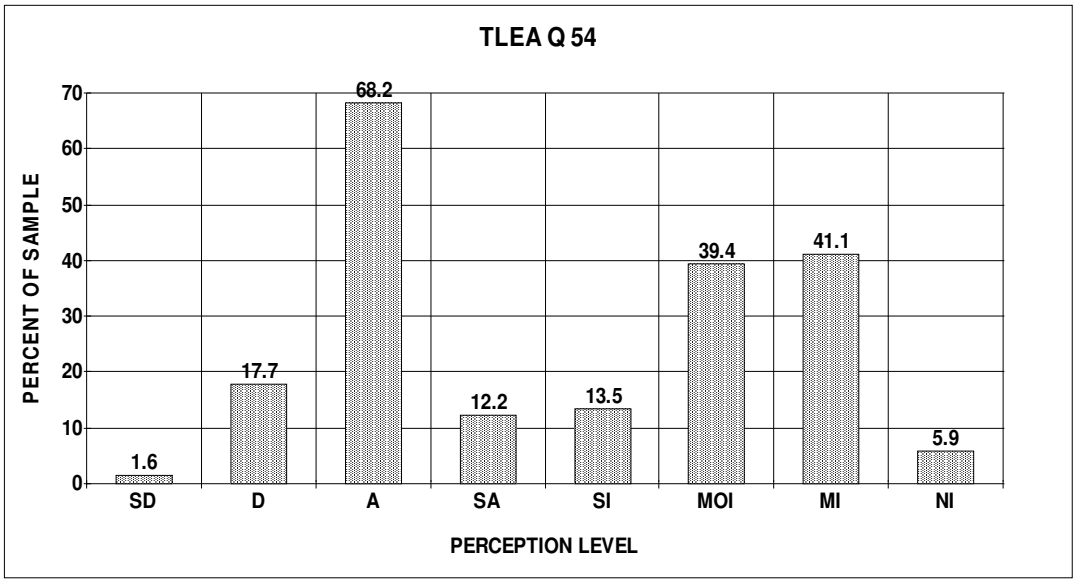

Figure 54:- Exterior walls, or windows and trim were painted fewer than 5 years ago or are in excellent condition.

Respondents agree at a high level (80.4%) that exterior walls are in excellent condition. They perceive that this factor has minimal to no impact on the learning environment at a 47% level and a significant to moderate impact at a 52.9% level.

Figure 55 depicts the responses to statement 55: Location of facility enhances the learning climate of the school.

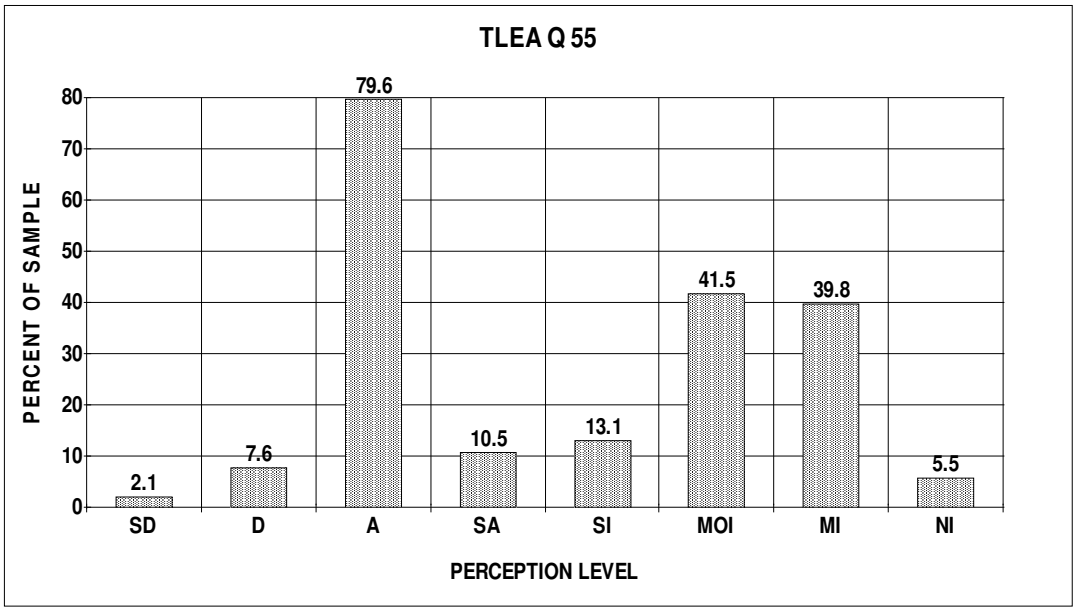

Figure 55: Location of facility enhances the learning climate of the school.

The environment surrounding the school should be compatible with the educational needs and developmental level of the students. The first impression of the school as it is approached should be positive. The building should look inviting to adults and children. The pleasant or unpleasant reaction that one has as they approach the school site is often a psychological one and the location plays a critical role in this. Safe and healthy conditions are essential to the well being of students and teachers. Areas affected by pollution, toxic waste, emissions, or explosions must be avoided. The site must be free from disturbing noises such as railways and airline traffic. Proper zoning restrictions will help the learning environment by limiting or eliminating proximity of liquor and pornography establishments (Hawkins and Lilley, 1998). Respondents overwhelmingly agree (90.1%) that the location of the facility enhances the learning climate of the

school. They perceive that this aspect has a significant to moderate impact on the learning environment at a 54.6% level. Subjects perceive minimal to no impact on the learning environment at a 45.3% level.

Figure 56 depicts the responses to statement 56: Color schemes, building materials, and décor provide an impetus to learning. This statement marks the beginning of Interior Environment queries in the survey.

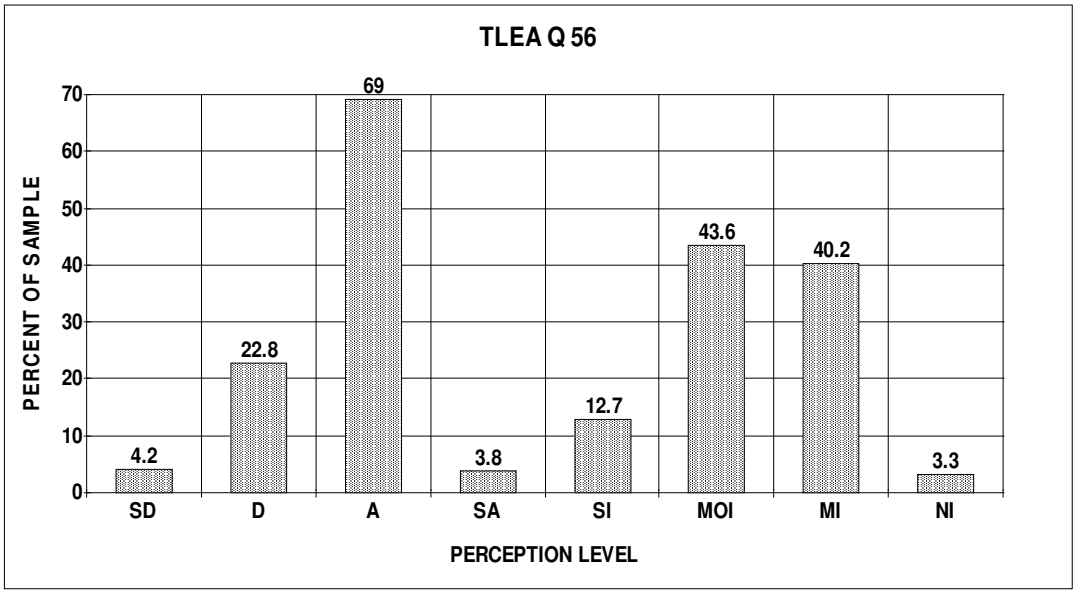

Figure 56: Color schemes, building materials, and décor provide an impetus to learning.

Color schemes in the learning environment have been examined in several studies and have been found to significantly impact the learning environment (Chan, 1996). School coloring creates more controversy than any other surface treatment used in school buildings. Cultural style, historic and symbolic traditions are evoked by the colors

chosen for the learning environment (Lang, 2005). Color selection is complicated by the variety of user perceptions in the learning environment. Functional colors provide an advantage over personal choice in color schemes. Warm colors draw emotional and visual interest outward in students while cool colors have the opposite affect. Cool colors are best for middle level facilities especially in areas where individualized studies are used (Brubaker, 1998). Respondents agree that this factor exists at a 72.8% level. A small percentage (27%) disagrees that color schemes in their buildings provide an impetus to learning. Subjects are divided on the impact that this factor has on their learning environment. Fifty-six point three percent perceive a significant to moderate impact on the learning environment while 43.5% perceive minimal or no impact on the learning environment.

Figure 57 depicts the responses to statement 57: Year around comfortable temperature and humidity are provided throughout the building.

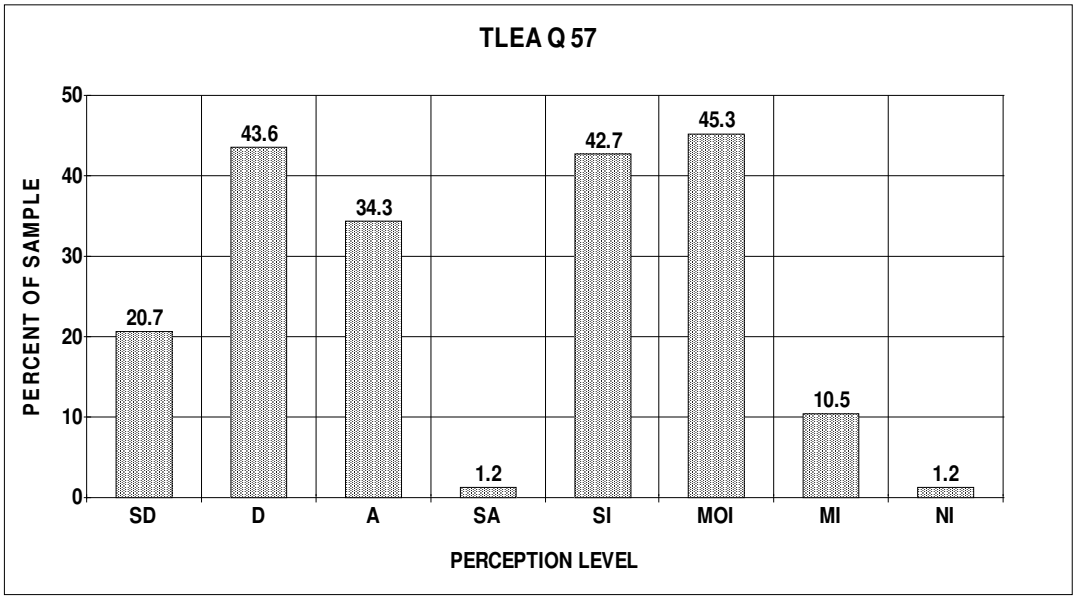

Figure 57: Year round comfortable temperature and humidity are provided throughout the building.

Humidity and temperature are critical components to Indoor Air Quality (IAQ) in a school facility. School temperatures are most ideal in a range between 68 to 74 degrees Fahrenheit (Schneider, 2002). Temperatures above 74 degrees produce harmful physiological effects that decrease work efficiency and output. Reading and math skills are adversely affected by higher temperatures (Lackney, 1994a). Humidity levels greater than 72% promote the growth of bacteria, mold and mildew. These conditions will contribute to respiratory illnesses in children. An unbalanced interaction between temperature and humidity has a great impact on the learning environment (Schneider, 2002). Respondents largely disagree (64.3%) that comfortable temperatures are provided in their facilities. Their perception corroborates the research that proves this factor significantly impacts the learning environment (88%).

Figure 58 depicts responses to statement 58: The floor plan of the building helps direct student movement and minimizes student disruptions.

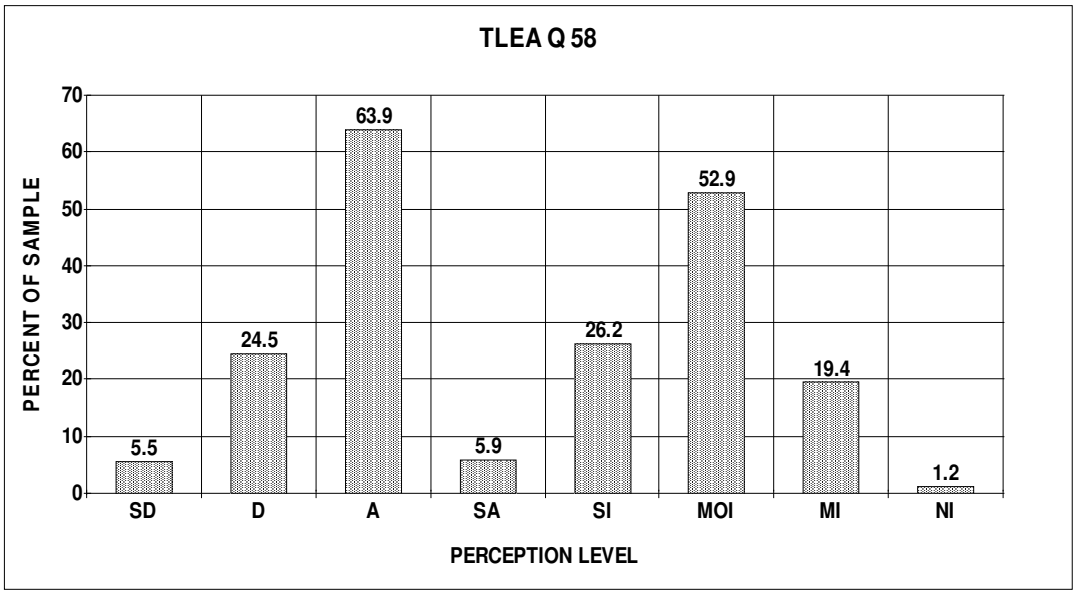

Figure 58: The floor plan of the building helps direct student movement and minimizes student disruptions.

The interior environment of school buildings is greatly improved with the feeling of openness. This does not require an open concept but corridors must be conveniently wide and should lead to common areas or other areas where students can find relief from an egg crate design. Administrators must be able to control and manage large crowds of students and a carefully designed floor plan can optimize this requirement (Hawkins and Lilley, 1998). Respondents agree that their floor plan facilitates student movement and minimizes student disruptions at a 69.8% level. Subjects overwhelmingly perceive this factor to have a significant to moderate impact on the learning environment. They

perceive at a 79.1% level that the floor plan significantly impacts the learning environment.

Figure 59 depicts the responses to statement 59: Ventilating system provides adequate circulation of clean air and meets Indoor Air Quality (IAQ) standard requirements.

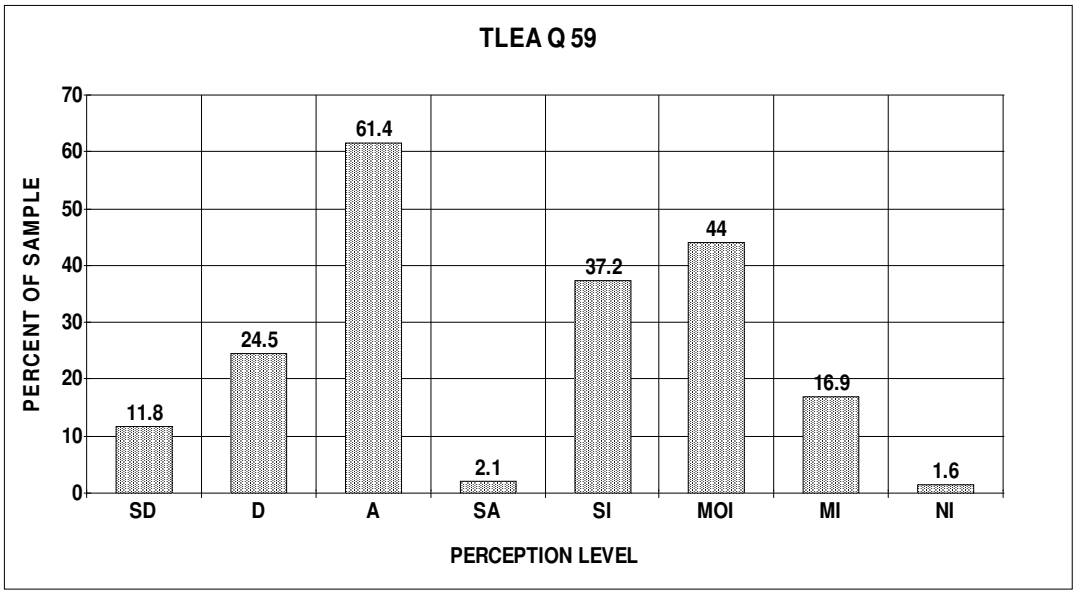

Figure 59: Ventilating system provides adequate circulation of clean air and meets Indoor Air Quality (IAQ) standard requirements.

Respondents agree (63.5%) that this factor exists in their facility. They perceive that this factor significantly and moderately impacts the learning environment at an 81.2% level.

Figure 60 depicts the responses to statement 60: Lighting systems provide proper intensity, diffusion, and distribution of illumination.

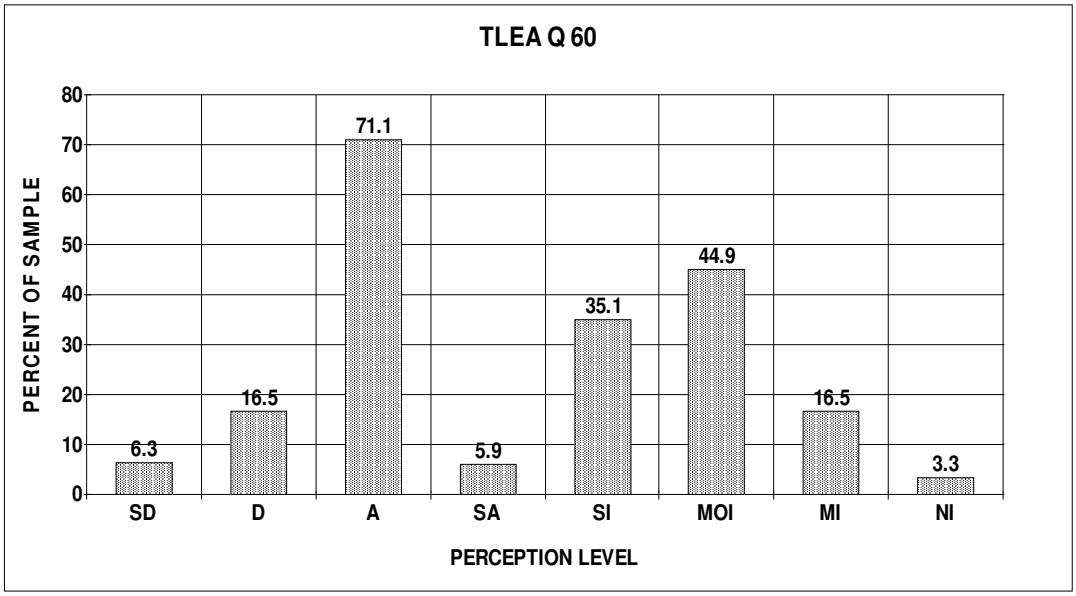

Figure 60: Lighting systems provide proper intensity, diffusion, and distribution of illumination.

Proper lighting has a great impact on the learning environment. Appropriate lighting improves test scores, reduces poor behavior, and plays an important role in student achievement. At a more basic level, lighting has a dramatic biological effect on humans. Physiological factors such as visual acuity, glandular, and metabolic rates are impacted by inappropriate lighting. Emotionally, lighting can affect depression levels and mood swings (Lackney, 199a). The study by the Heschong Mahone Group in 1999 which studied 2,000 classrooms indicated that students exposed to higher levels of natural day lighting progressed 20% faster in one year in math, and 26% faster in reading (Schneider, 2005). Classrooms with well designed natural sky-lighting had students progressing 19 to 20 % faster in math and reading than students without natural lighting. It is shown that natural lighting improves visibility, light quality, health, and mood in

teachers and students (Kennedy, 1999). There must be a balanced combination of natural and artificial lighting though. When comparing full spectrum fluorescent, cool white fluorescent, and natural light, a balance among these three can improve student behavior (Lackney, 1999b). The way in which school facilities utilize lighting is one of the most important factors in the learning environment. It affects mental attitude, class attendance, and academic performance (Lyons, 2002). Respondents in these facilities overwhelmingly agree at a 77% level that appropriate lighting is provided. A small percentage (22.8%) perceives that this factor is not present. The subjects perceive that this appropriate lighting significantly and moderately impacts the learning environment. They overwhelmingly (80%) corroborate the fact that balanced lighting has a great impact on the learning environment. A small percentage (19.8%) perceive minimal or no impact on the learning environment.

Figure 61 depicts the responses to statement 61: Sufficient drinking fountains and restroom facilities are conveniently located per building code.

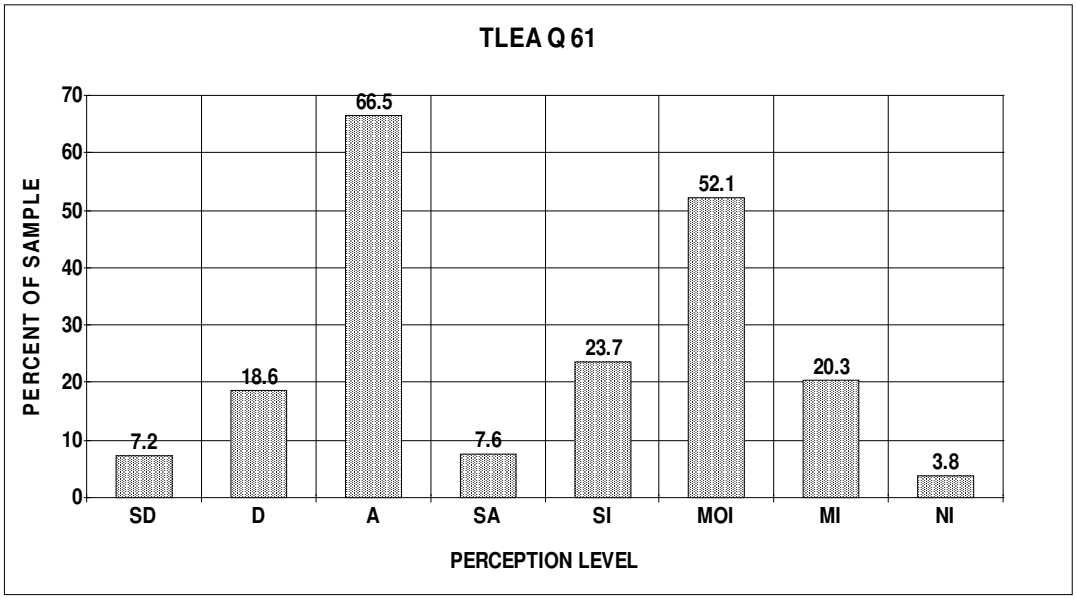

Figure 61: Sufficient drinking fountains and restroom facilities are conveniently located per building codes.

At the middle school level, the formula for sufficient restroom toilets is 1:75 for boys and 1:45 for girls. Each of the six middle schools has on average 1,000 students which mandate 13 toilets for boys and 22 for girls. The emphasis is on the way in which restrooms, lavatories, toilets, and water fountains aid the learning environment. These very functional needs must be available on all floors, extended wings, and near common areas. Location in terms of distance is a critical aspect of this feature. These facilities aid the learning environment the most when they are easily found. These facilities should be placed in areas where first time visitors and occupants may find them through their own logic (Hawkins and Lilley, 1998). Respondents agree at a high (74.1%) level that these facilities are per building code and located conveniently throughout the building. Subjects also perceive that this factor has a significant to moderate impact on

the learning environment at a high level (75.8%). A small number of respondents (24.1%) perceive that this factor has minimal or no impact on the learning environment.

Figure 62 depicts the responses to statement 62: Communication among students is enhanced by common areas.

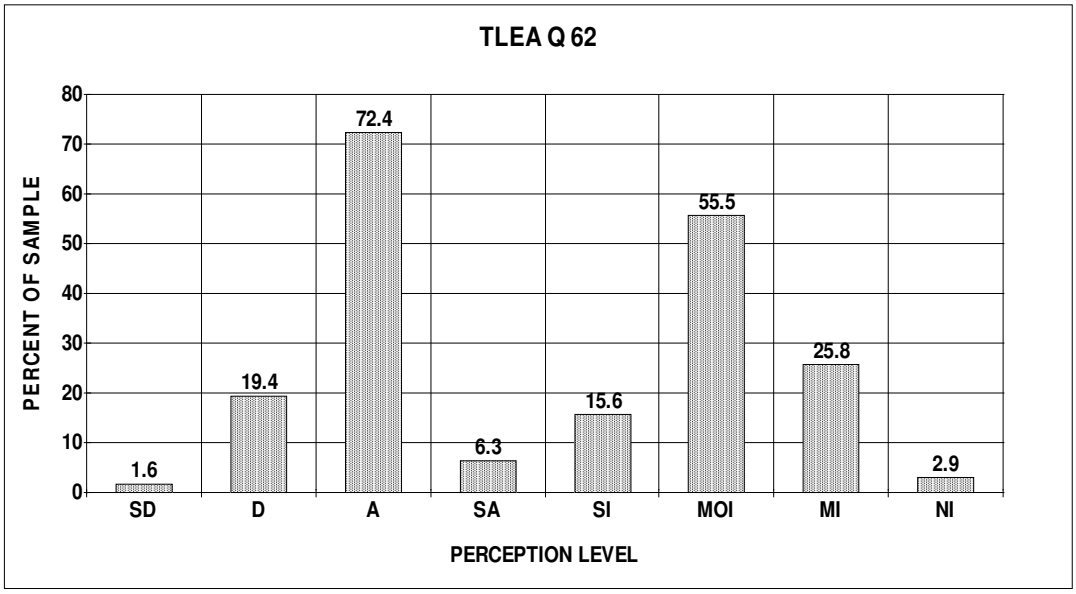

Figure 62: Communication among students is enhanced by common areas.

Socialization is a critical need for middle aged children. They need ample space to decompress, build relationships, and expend energy (Long, 1993). The learning environment is enhanced by spaces that allow for the socialization process to occur and much of this takes place in non-classroom settings. The commons has become recognized as an important part of the school, especially for middle school students. These large areas serve as a place that enables students to gather, converse, share ideas, and strengthen their identity with the school. Small group areas with benches or other

seating contributes greatly to the aesthetic quality of the building. The commons is normally located centrally in a building and is adjacent to cafeteria, auditorium, and library (Hawkins and Lilley, 1998). Subjects agree at a high level (78.7%) that the commons is adequate for their facility. They perceive this aspect to have a significant to moderate impact on the learning environment at a 71.1% level. A small percentage of respondents (28.7%) perceive that this aspect has minimal or no impact on the learning environment.

Figure 63 depicts the responses to statement 63: Appropriate foyers and corridors aid traffic flow.

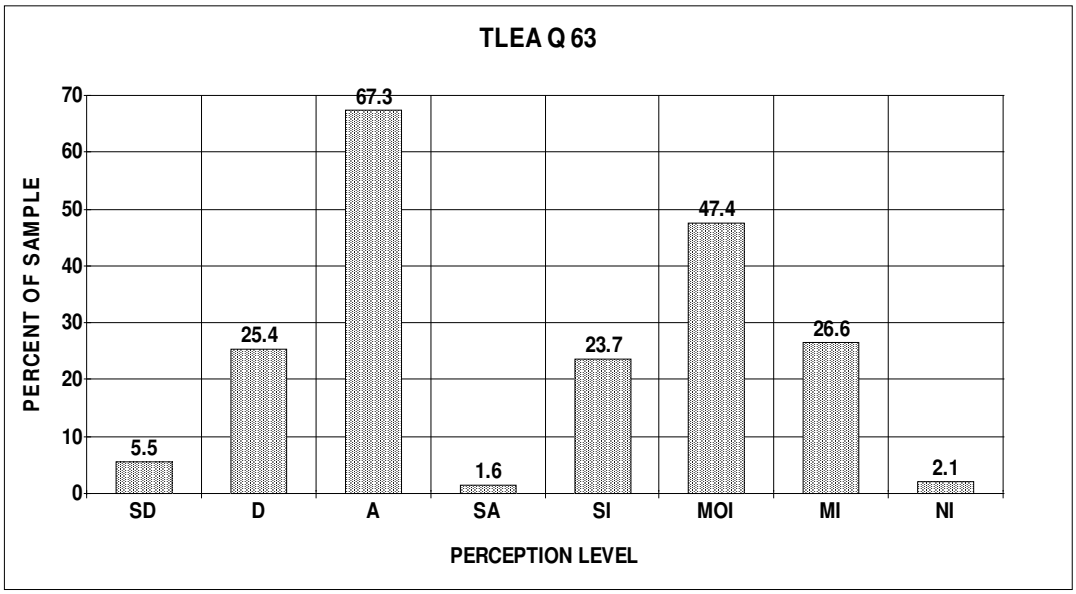

Figure 63: Appropriate foyers and corridors aid traffic flow.

Subjects agree at a 68.9% level that this factor exists in their facilities and perceive significant to moderate impact on the learning environment at a 71.1% level.

Figure 64 depicts the responses to statement 64: Areas for students to interact are suitable to the age group.

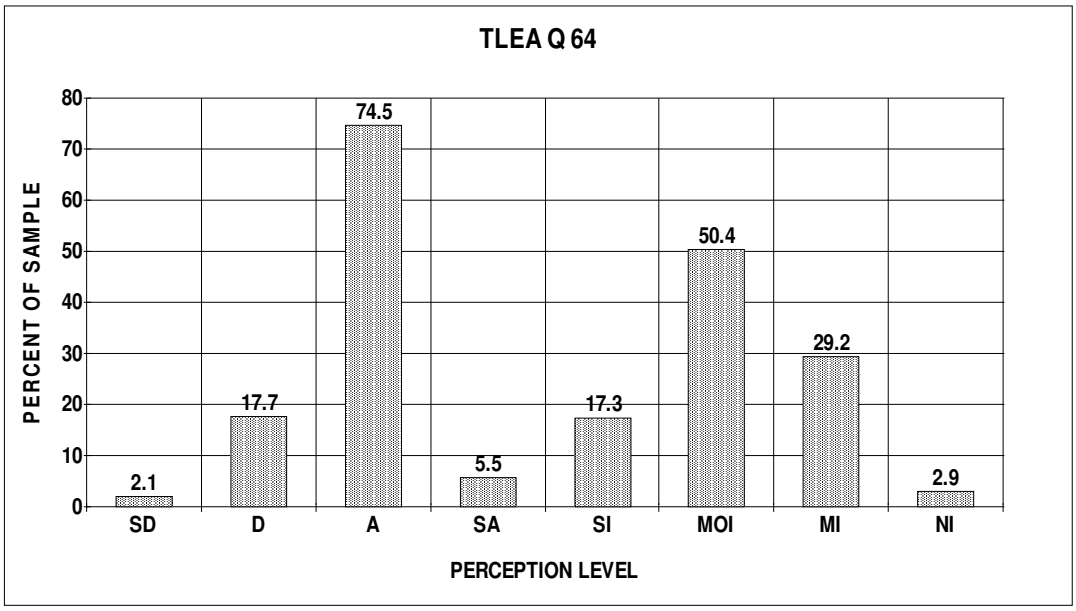

Figure 64: Areas for students to interact are suitable to the age group.

Respondents strongly agree at an 80% level that common areas are suitable for the age group in their facilities. They perceive that these areas impact the learning environment at a significant to moderate degree at a 67.7% level and minimal to no impact at a 32.1% level.

Figure 65 depicts the responses to statement 65: Large group areas are designed for effective management of students.

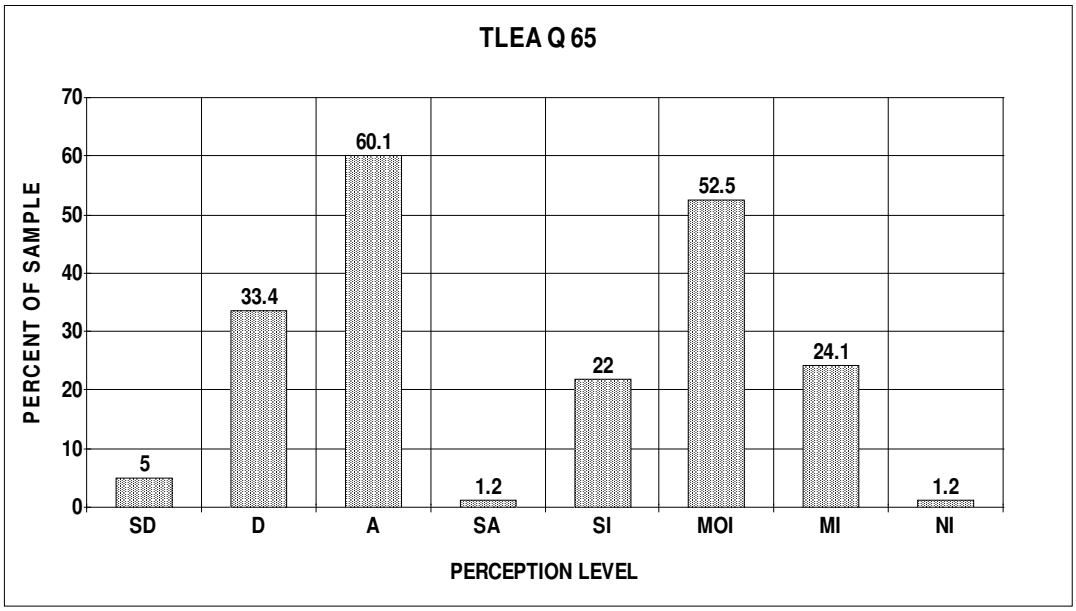

Figure 65: Large group areas are designed for effective management of students.

Large group areas in this statement are those used for instruction such as gymnasiums, auditoriums, multi-purpose rooms, music rooms, and libraries. These areas should be designed for visual supervision of students. Narrow corridors, alcoves, visual barriers, and partial walls can detract from student management and contribute to misbehavior. Some provision for sound control in these areas will contribute to the aesthetic quality of the space (Hawkins and Lilley, 1998). Respondents agree at a 61.3% level that these areas are effectively designed and disagree at a 38.4% level. They perceive a significant to moderate impact on the learning environment at a 74.5% level.

Figure 66 depicts the responses to statement 66: Acoustical treatment of ceilings, walls, and floors provide effective sound control.

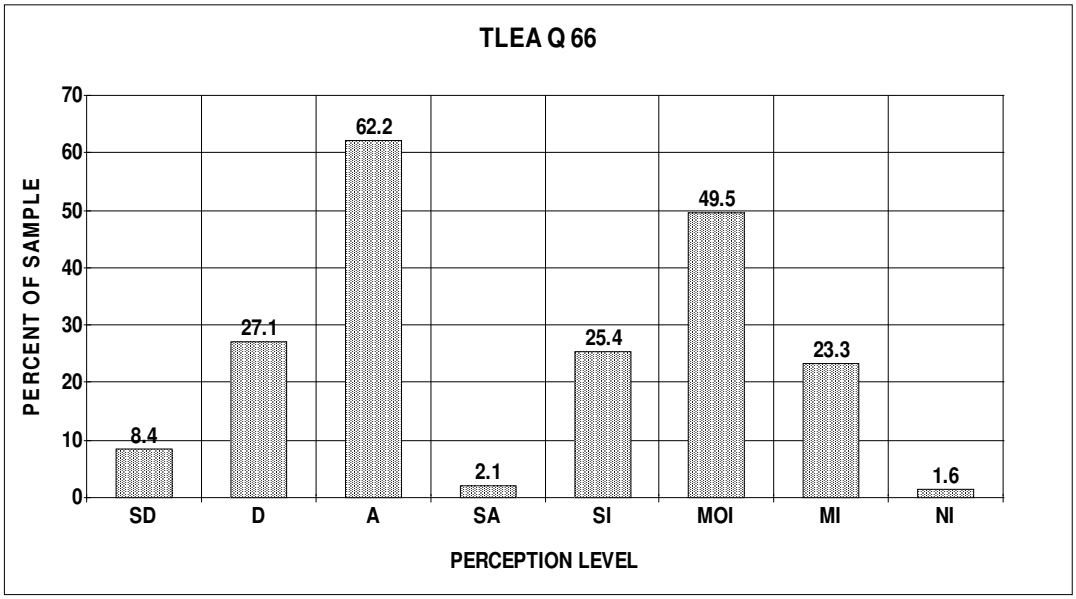

Figure 66: Acoustical treatment of ceilings, walls, and floors provide effective sound control.

Areas such as classrooms, auditoriums, and music rooms are more effective to teaching and learning if efforts are made to control sound. Ceilings are usually treated with acoustical plaster or ceiling tiles. Sidewalls of these spaces can be sound proofed through the use of draperies, small sections of acoustical tile, or other material that decreases the amount of sound reverberation. Floors can be made sound absorbent through the use of carpet which accomplishes this need more than any other flooring surface (Hawkins and Lilley, 1998). Echoing can also be decreased by wall angling with sound insulation (Lang, 2005). Subjects agree at a 63.3% level that sound control is effectively provided in their facilities. They disagree at a 35.5% level that this factor is present. Respondents perceive that this factor significantly and moderately impacts the learning environment at a 74.9% level.

Figure 67 depicts responses to statement 67: The majority of classrooms have windows.

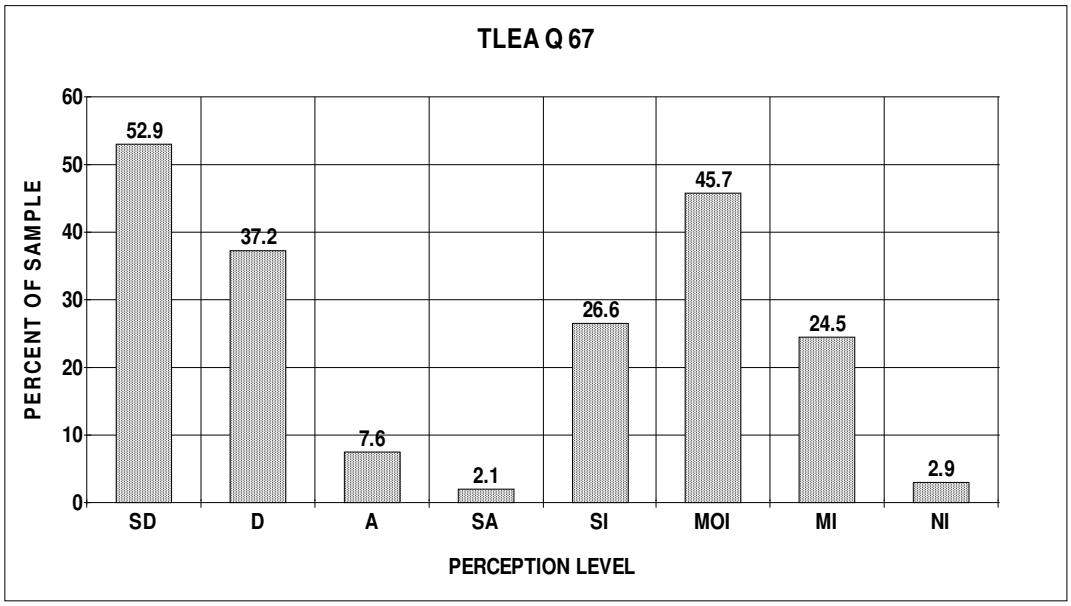

Figure 67: The majority of classrooms have windows.

The way in which buildings are lighted is one of the most important factors in an effective learning environment. Lighting affects mental attitude, class attendance, and academic performance (Lyons, 2002). Natural lighting provided by windows or well designed sky lighting has been found to increase math performance and reading performance in students. Well designed natural lighting has been proven to increase visibility, light quality, health, and mood in teachers and students (Kennedy, 1999). Contrary to the importance of natural lighting through windows shown in the research, subjects overwhelmingly disagree (90.1%) that this factor exists in their facilities. These results indicate that these middle school facilities lack the necessary and recommended

levels of natural lighting in middle schools. Respondents perceive that windows have a significant to moderate impact on the learning environment at a 72.3% level. They perceive minimal to no impact on the learning environment at a 27.4% level.

Figure 68 depicts the responses to statement 68: Classroom furniture and equipment are moveable and can be arranged in different ways facilitating group projects and various activities or in accordance with the prescribed instructional methodology.

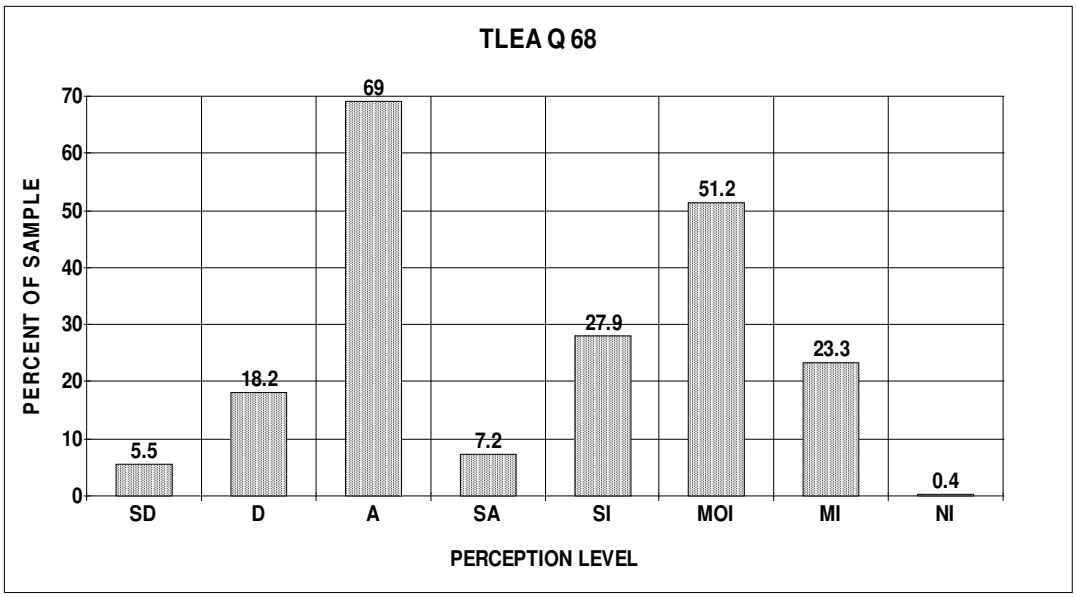

Figure 68: Classroom furniture and equipment is moveable and can be arranged in different ways facilitating group projects and various activities or in accordance with the prescribed instructional methodology.

Flexibility and mobility in the school facility and the classroom are critical points in creating effective, adequate, and high quality learning environments. Facilities that support varied learning styles create the best learning environment (Diehl, 1998). Sanoff

(2000) found that flexible classrooms where teachers and students can re-arrange existing furniture and walls suggest a student centered learning environment. The flexible classroom allows for multiple activities from projects to presentations, and group work. Clayton (2001) found that flexible classrooms which allow for group activities and interpersonal interaction enhance the learning environment greatly. This flexibility is critical to student development, learning and attitudes. Respondents agree that this flexibility is present at a 76% level. The subjects also perceive a significant to moderate impact on the learning environment at a 79.1% level.

Figure 69 depicts the responses to statement 69: Classroom furniture is functionally sound and facially attractive.

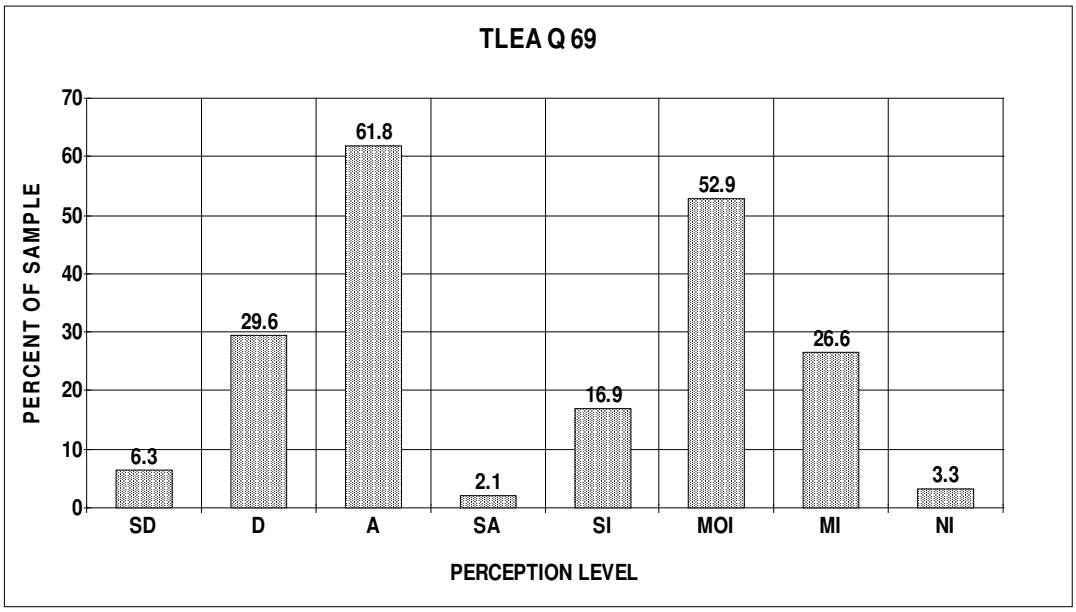

Figure 69: Classroom furniture is functionally sound and facially attractive.

Respondents agree at a 63.9% level that furniture is adequate and perceive a significant to moderate impact on the learning environment at a 69.8% level.

Figure 70 depicts the responses to statement 70: With the exception of gym, music, shop, home economics, and art, classrooms are carpeted.

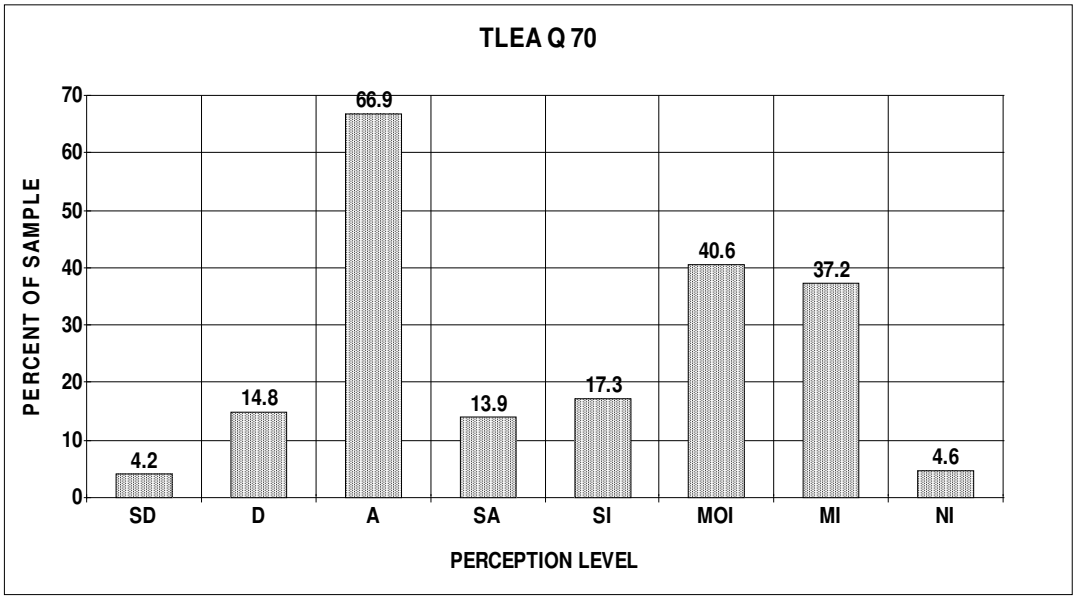

Figure 70: With the exception of gym, music, shop, home economics, and art, classrooms are carpeted.

Respondents agree at a very high level (80.8%) that classrooms are carpeted in their facilities. They are divided on their perception of the impact that carpeted floors have on the learning environment. They perceive a significant and moderate impact at a 57.9% level and minimal or no impact at a 41.8% level.

Figure 71 depicts the responses to statement 71: Proper maintenance (interior) of school facility is a priority and vandalism or graffiti are repaired/removed quickly.

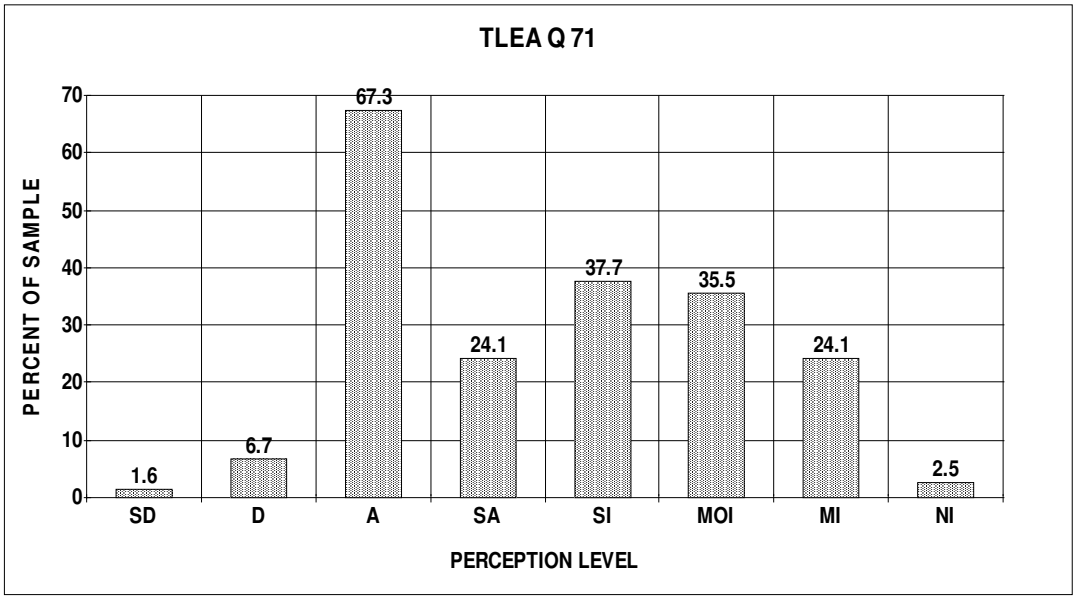

Figure 71: Proper maintenance (interior) of school facility is a priority and vandalism or graffiti are repaired/removed quickly.

Deliberate damage to windows, vandalism, and graffiti will detract from the most attractive schools and the learning environment. Repairing and removing this type of damage quickly is critical to a safe and positive learning environment. It is best to attend to this type of maintenance problem immediately, before building users see it. Aggressive maintenance in this area can result in a significant drop in this type of problem (Milshtein, 2004). Respondents overwhelmingly agree (91.4%) that rapid response maintenance on the interior of their facilities is existent. Subjects also perceive that this aspect has a significant and moderate impact on the learning environment at a significant level (73.2%).

Figure 72 depicts the responses to statement 72: Custodial daily routines are effective in keeping facility clean and attractive.

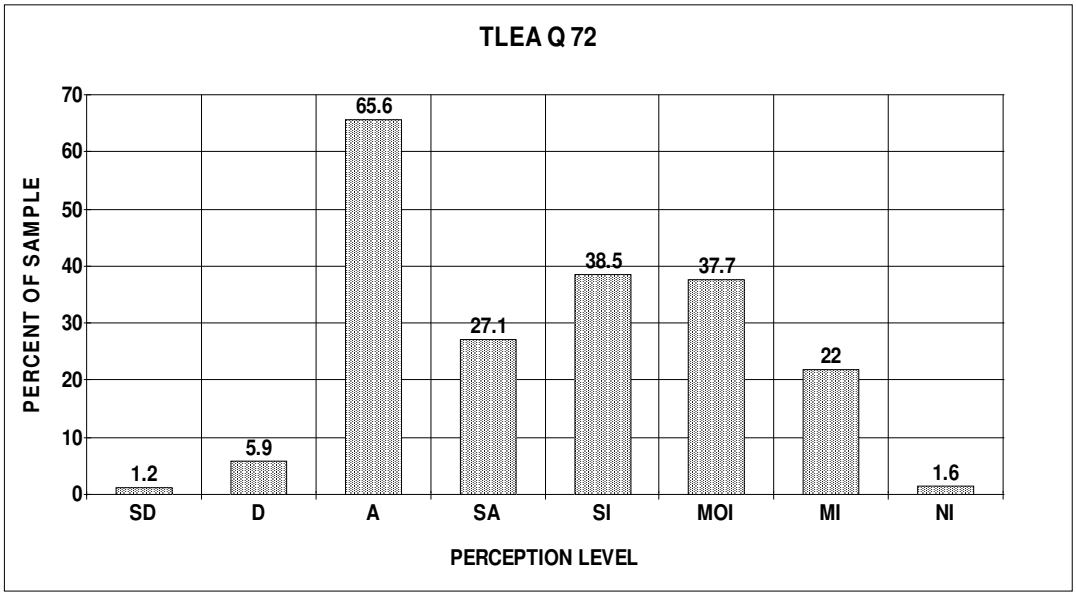

Figure 72: Custodial daily routines are effective in keeping facility clean and attractive.

The condition and cleanliness of school facilities is not a superficial concern. There is a correlation between facility condition and cleanliness and student achievement, user satisfaction, student behavior, and student safety. Facility cleanliness affects the perception of students, staff, parents, and community, and ultimately their support of their schools (Moore, 2004). The general inside appearance of the facility should be conducive to learning and inviting to students. The emphasis from custodial care should be on the general quality of the building rather than the routine care and maintenance of the facility (Hawkins and Lilley, 1998). Subjects agree at a very significant level (92.7%) that custodial routines keep the facility clean and attractive. They also perceive that this aspect has a significant to moderate impact on the learning environment at a 76.2% level.

Figure 73 depicts the responses to statement 73: The condition of your facility is excellent both cosmetically and structurally.

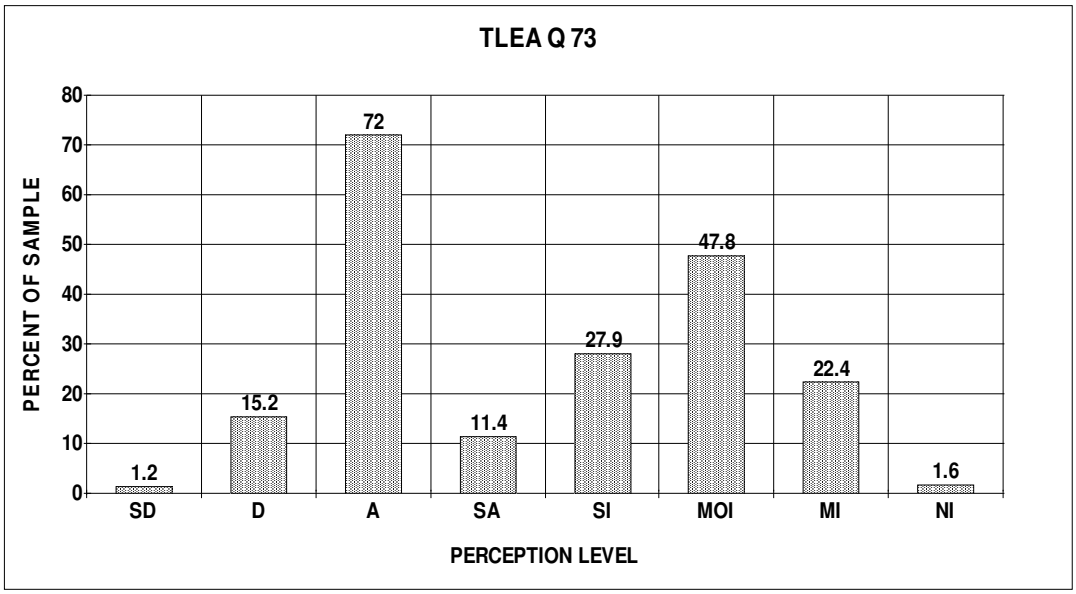

Figure 73: The condition of your facility is excellent both cosmetically and structurally.

Respondents agree that their facilities are in excellent condition at a high percentage (83.4%) and perceive a significant to moderate impact on the learning environment at a 75.7% level.

Figure 74 depicts the responses to statement 74: There are a variety of places, both inside and outside of the school, where students can meet together in small and large groups.

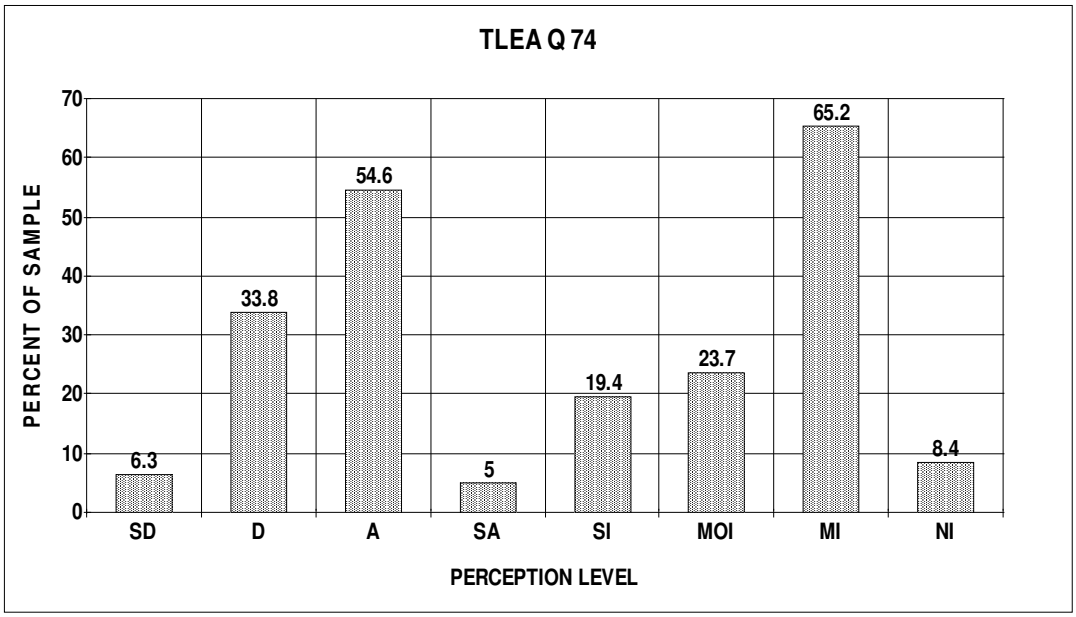

Figure 74: There are a variety of places, both inside and outside of the school, where students can meet together in small and large groups.

Socialization is a critical need for middle aged children. They need ample space to decompress, build relationships, and expend energy (Long, 1993). The learning environment is enhanced by spaces that allow for the socialization process to occur and much of this takes place in non-classroom settings. The emphasis should be on the quality of the space. It should be appropriately finished and decorated with places to sit and converse. Plantings and other decorations can produce an aesthetically pleasing setting (Hawkins and Lilley, 1998). Subjects agree that there are a variety of spaces in their facilities at a 59.6% level and disagree that this is the case at a 40.1% level. Respondents perceive that this aspect has a significant to moderate impact on the learning environment at a 71% level. They perceive minimal or no impact at a 28.7% level.

Figure 75 depicts the responses to statement 75: The school facility fosters communication.

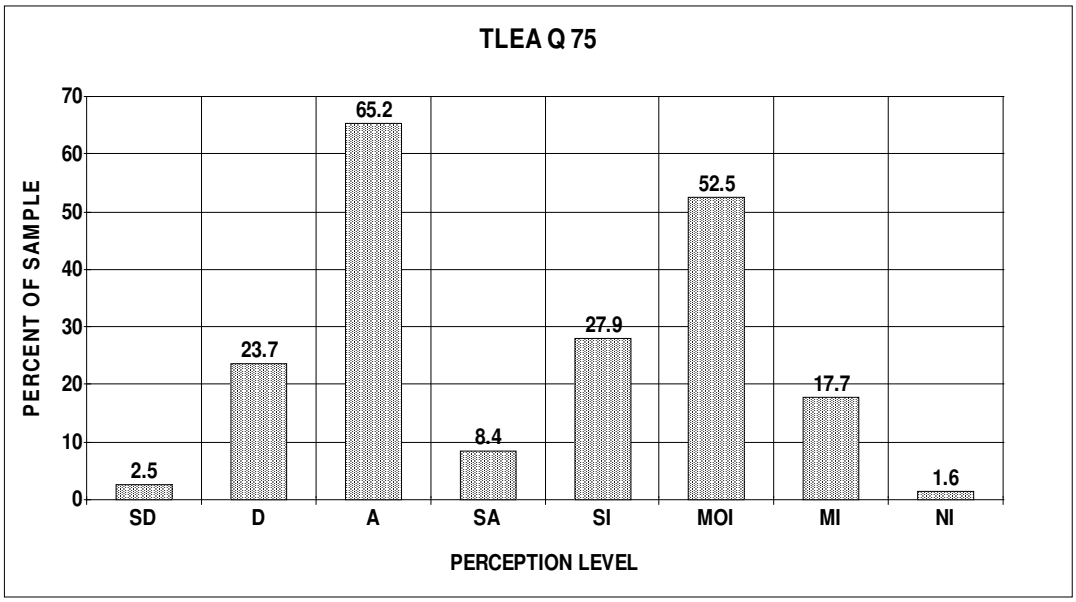

Figure 75: The school facility fosters communication.

Subjects agree at a 73.6% level that their facility fosters communication. They perceive that this aspect of their facility significantly and moderately impacts the learning environment at an 80.4% level and has minimal or no impact at a 19.3% level.

Figure 76 depicts the responses to statement 76: The school facility creates an appropriate behavioral setting.

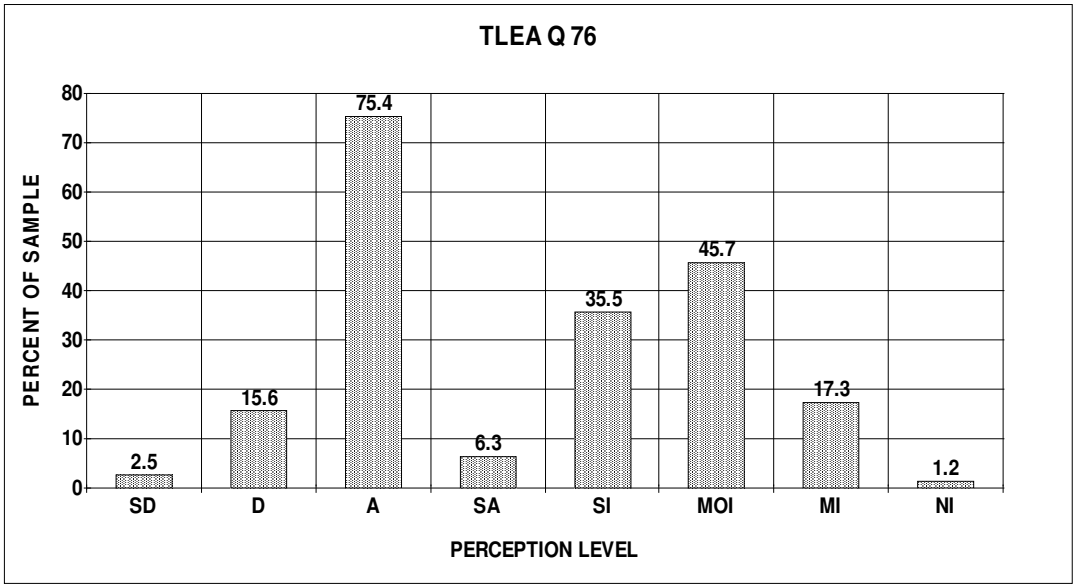

Figure 76: The school facility creates an appropriate behavioral setting.

The school house must be designed to provide opportunities for every youngster to develop all that is in him, mind, body, and spirit (Cutler, 1989). For two centuries, educational planners have understood that the relationship between the built environment and the surrounding environment creates the learning environment. This learning environment must meet the needs of the middle level child in order to maximize learning and positively influence student behavior. Successful middle schools must have a positive learning environment with as much consideration placed on who the student is as is placed how much the student learns (Finks, 1990). Respondents agree at a significant level (81%) that their facilities create an appropriate behavioral setting. They perceive that this aspect has a significant to moderate impact on the learning environment at a very high level (81.2%). A small percentage (18.4%) perceives that this aspect has minimal or no impact on the learning environment.

Figure 77 depicts the responses to statement 77: There are no visible indications of roof leaks in the school facility. This statement marks the beginning of the Visual Reinforcers queries in the survey.

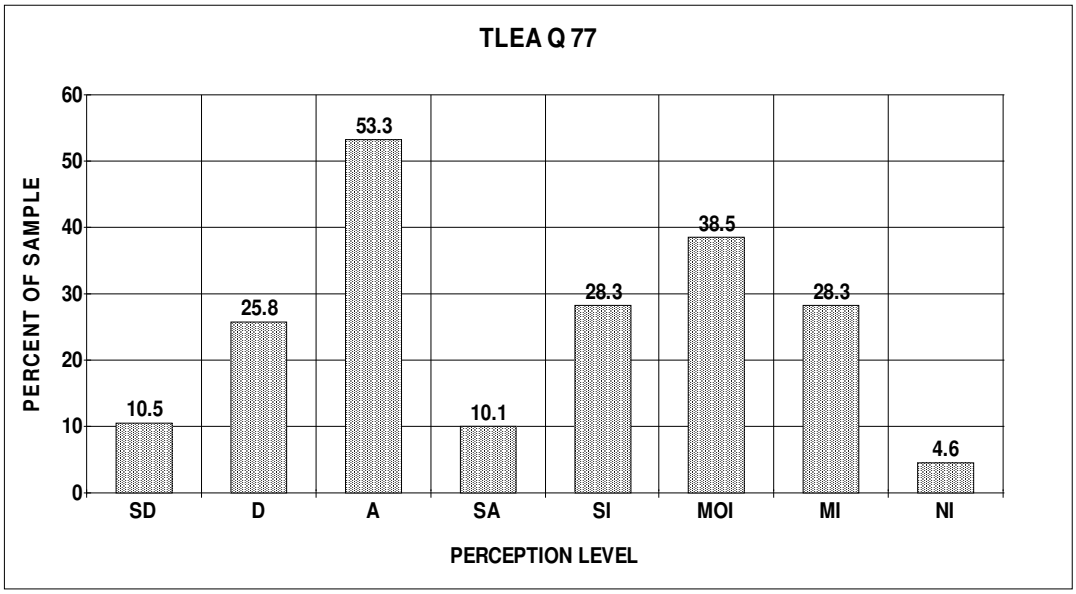

Figure 77: There are no visible indications of roof leaks in the school facility.

The most common structural problem in schools is roof leakage. The roof must be weather proof and insulated to the maximum extent that cost permits. Constant attention to proper roof pitch, proper drainage, and durability of plumbing is critical to ensure proper roof integrity. Flat roofs are usually insulated and covered with tar and gravel (Rittner-Heir, 2006). Glass in roofing is not recommended due to problems associated with sunlight control and heat gain and loss. Current building trends are towards seamless, pre-finished, pitched roofs (Hawkins and Lilley, 1998). Respondents agree at a 63.4% level that the roofs on their facilities are properly sealed to prevent leakage. A

small percentage (36.3%) disagree that roofs show no visible signs of leakage. Respondents perceive that leaky roofs cause a significant and moderate impact on the learning environment at a 66.8% level. Subjects perceive minimal or no impact on the learning environment at a 32.9% level.

Figure 78 depicts the responses to statement 78: Interior walls, including classroom spaces were painted less than 8 years ago and are in excellent condition.

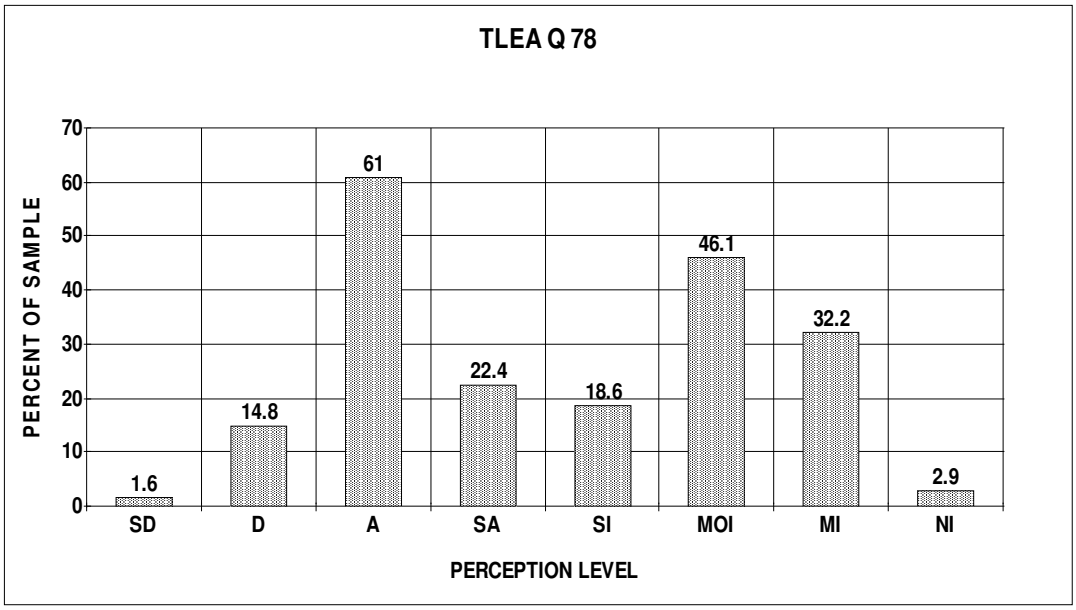

Figure 78: Interior walls, including classroom spaces were painted less than 8 years ago and are in excellent condition.

Respondents agree at an 83.4% level that painting is up to date and perceive a significant to moderate impact on the learning environment at a 64.7% level.

Figure 79 depicts the responses to statement 79: There are numerous displays or student work inside each classroom and on many corridor walls.

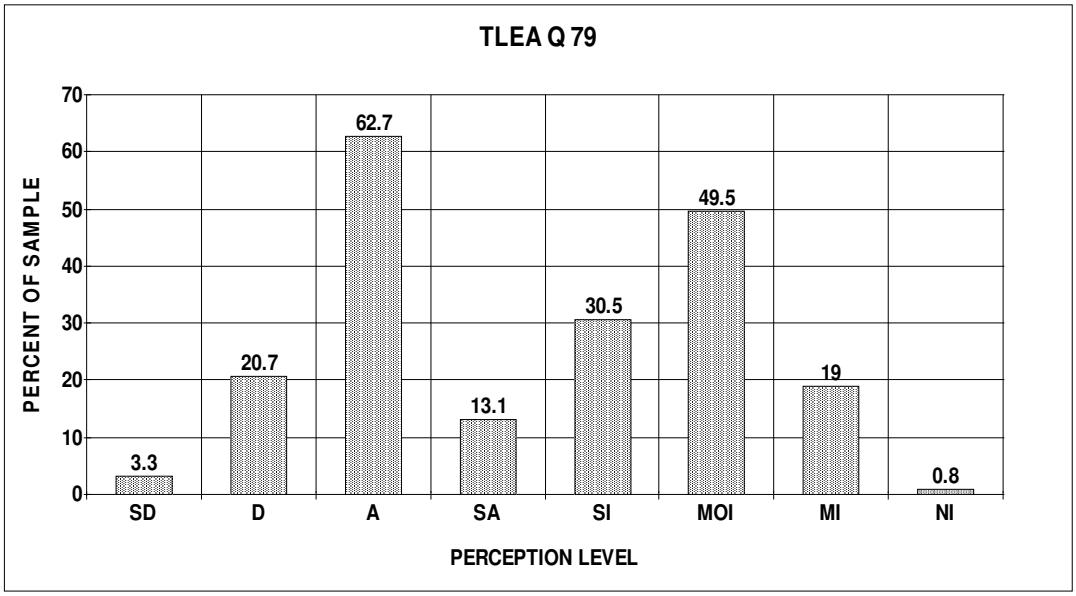

Figure 79: There are numerous displays or student work inside each classroom and on many corridor walls.

In order to create a positive, adequate and high quality learning environment for middle school students, the classroom must be responsive and tailored to the needs of the young adolescent customer. Student achievement must be recognized regularly and this can be accomplished by displaying student work on walls and bulletin boards around the classroom. In a physical sense, the walls must support the need to display student work (Finks, 1990). Classroom walls can act as tutors for children. Students will gain a sense of belonging and connection if they see their work displayed on the walls of their classroom. Young adolescents need this attention and desire to share themselves and their talents throughout their classrooms. Student decorations and displays on their walls personalize the classroom and are meaningful to children (Berry, 2001). Subjects agree at a 75.8% level that there are numerous displays of student work inside the classrooms

and on corridor walls. Respondents perceive that student work displays impact the learning environment significantly and moderately at an 80% level.

Figure 80 depicts the responses to statement 80: Classroom rules and consequences are posted in each room.

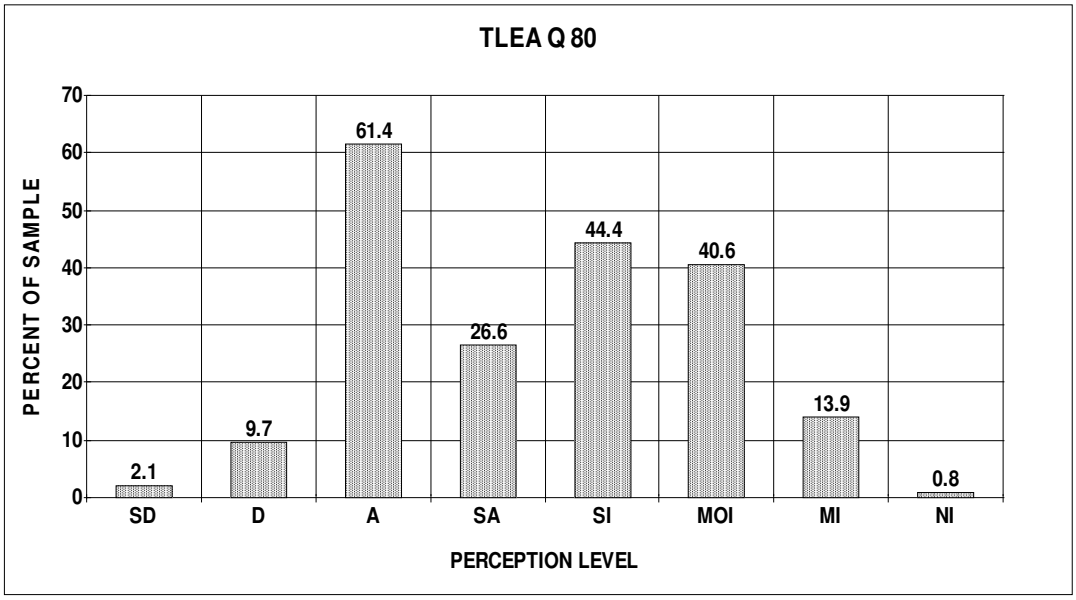

Figure 80: Classroom rules and consequences are posted in each room.

Effective, adequate, and high quality classrooms require effective classroom management procedures to promote independent learning and a positive learning environment. It is critically important that classroom rules with consequences be clear, concise, and visible. Classroom rules that meet these criteria are necessary for instruction to continue without major disruptions (Rademacher, Callahan, and Pederson-Seelye, 1998). By creating a sense of order, predictability, and trust in classrooms, a positive learning environment will prevail. Logical consequences are a critical

component to posted classroom rules. They help students regain self-control and reflect on their mistakes. However, rules and consequences are ineffective if they are not communicated clearly to students. Therefore they must be posted in a visible location in the classroom ("Everyday rules that really work!", 2006). Respondents agree at a significant level (88%) that rules and consequences are posted in classrooms. They perceive a significant to moderate impact on the learning environment at an 85% level.

Figure 81 depicts the responses to statement 81: Student and class accomplishments are highlighted in the classroom and throughout the building.

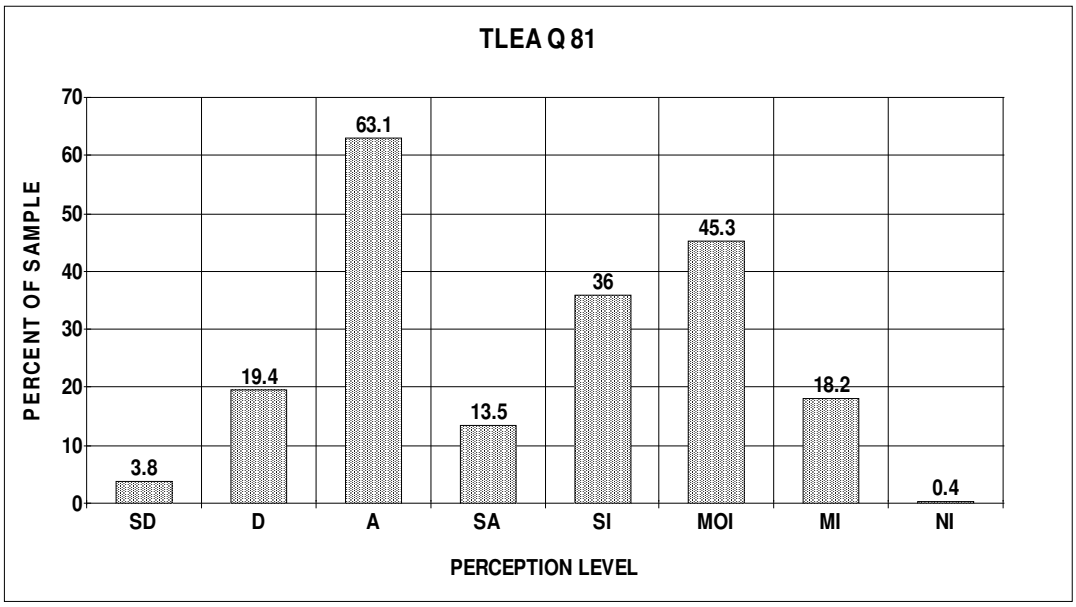

Figure 81: Student and class accomplishments are highlighted in the classroom and throughout the building.

Respondents agree at a 76.6% level that this factor exists and perceive a significant to moderate impact on the learning environment at an 81.3% level.

Figure 82 depicts the responses to statement 82: There are posters, mobiles or displays relating to topics being studied.

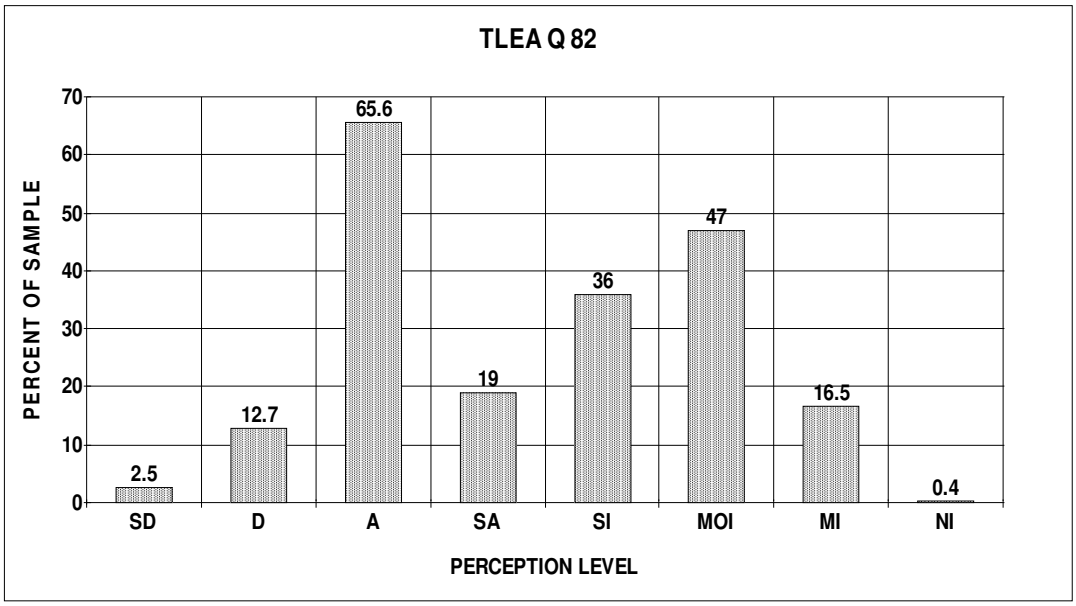

Figure 82: There are posters, mobiles or displays relating to topics being studied.

Subjects agree at a significant level (84.6%) that topical visuals are present in the classrooms. They perceive that this aspect has a significant to moderate impact on the learning environment at an 83% level.

This concludes the presentation of raw data from the survey of 236 respondents concerning the perceived adequacy of middle school facilities and the impact that they have on the learning environment. The following tables and figure organize the above data into adequacy means and standard deviations, impact means and standard deviations, and scatter plot of adequacy means versus impact means.

Table 9 depicts adequacy and impact means in descending order of adequacy.

Table 9: Adequacy means and standard deviations in descending order of adequacy means with corresponding question numbers, impact means and standard deviations

Question	Adequacy Mean	SD	Impact Mean	SD
12	3.31	0.86	2.94	0.78
72	3.18	0.83	3.13	0.83
71	3.13	0.91	3.08	0.78
80	3.12	0.82	3.28	0.86
34	3.11	0.79	2.71	0.70
36	3.04	0.79	2.86	0.78
78	3.04	0.78	2.80	0.73
15	3.02	0.78	3.15	0.78
44	3.02	0.72	2.64	0.68
49	3.02	0.72	3.02	0.78
19	3.00	0.78	3.31	0.89
48	3.00	0.65	2.75	0.72
82	3.00	0.78	3.18	0.83
55	2.98	0.78	2.62	0.72
30	2.97	0.78	3.26	0.86
73	2.93	0.78	3.02	0.85
40	2.92	0.77	3.20	0.83
20	2.91	0.76	3.05	0.78
54	2.91	0.76	2.60	0.72
70	2.91	0.76	2.70	0.70
81	2.86	0.77	3.16	0.98
76	2.85	0.73	3.15	0.81
79	2.85	0.73	3.09	0.85
51	2.84	0.73	2.49	0.65
47	2.83	0.74	2.45	0.65
62	2.83	0.75	2.83	0.74
64	2.83	0.73	2.84	0.73
53	2.80	0.73	2.55	0.65
21	2.79	0.73	2.97	0.78
75	2.79	0.73	3.06	0.79
17	2.78	0.73	3.00	0.78
37	2.78	0.73	2.73	0.72
50	2.78	0.73	2.60	0.68
3	2.77	0.73	3.16	0.52
68	2.77	0.73	3.06	0.79
60	2.76	0.73	3.11	0.78
26	2.74	0.70	3.11	0.80
61	2.74	0.71	2.95	0.78
33	2.72	0.71	2.81	0.73
56	2.72	0.70	2.62	0.68
58	2.70	0.72	3.04	0.65
32	2.69	0.70	2.89	0.76

Table 9: Continued

Question	Adequacy Mean	SD	Impact Mean	SD
35	2.67	0.70	2.91	0.76
63	2.65	0.67	2.92	0.78
11	2.63	0.21	3.04	0.78
14	2.63	0.68	2.99	0.78
22	2.63	0.68	3.13	0.79
77	2.63	0.68	2.90	0.78
9	2.62	0.68	3.14	0.81
18	2.62	0.68	3.01	0.78
42	2.62	0.68	2.76	0.73
1	2.60	0.68	3.25	0.91
23	2.60	0.68	3.05	0.78
41	2.60	0.68	2.47	0.65
27	2.59	0.68	3.22	0.83
69	2.59	0.68	2.83	0.76
45	2.58	0.68	2.45	0.65
66	2.58	0.68	2.98	0.78
74	2.58	0.68	2.88	0.78
29	2.57	0.68	3.08	0.79
46	2.57	0.61	2.23	0.74
65	2.57	0.68	2.95	0.72
7	2.56	0.68	2.80	0.74
8	2.55	0.66	2.96	0.78
13	2.55	0.65	3.17	0.83
16	2.53	0.65	2.85	0.78
59	2.53	0.65	3.16	0.83
24	2.50	0.65	3.27	0.86
25	2.49	0.65	3.19	0.83
43	2.49	0.65	2.75	0.70
52	2.47	0.72	2.99	0.78
2	2.40	0.62	3.20	0.83
39	2.40	0.62	2.97	0.78
5	2.26	0.36	2.80	0.73
6	2.23	0.59	2.56	0.68
31	2.17	0.57	2.97	0.78
57	2.16	0.57	2.95	0.78
38	2.15	0.52	2.88	0.75
4	2.10	1.91	3.30	0.91
10	1.98	0.39	3.10	0.81
28	1.90	0.52	3.18	0.83
67	1.58	0.35	2.96	0.78

The TLEA instrument posited statements in such a way that the factor is considered to be highly adequate. Therefore, if respondents strongly agreed with the statement, the factor was considered to be very adequate with a score of 4. A score of 3 indicated that a factor was moderately adequate, 2 minimally adequate, and 1 not inadequate. Impact scores are as follows: significant impact-4, moderate impact-3, minimal impact-2, no impact-1. The range of adequacy means varied from a high mean of 3.31 to a low mean of 1.58. Standard deviations ranged from 1.91 which indicates a high level of variation in responses to .21 indicating a low variation in responses.

Several responses to statements immediately surfaced with unique means and standard deviations. The responses to statement 67: The majority of classrooms have windows, indicated that this factor was very inadequate with a mean score of 1.58. The standard deviation of .35 indicated that there was low variance from subjects. In other words, most respondents agreed that this factor is very inadequate. This factor had an impact mean of 3.30 which falls between moderate and significant impact levels. The adequacy mean of statement 28: space for small groups and remedial instruction is provided adjacent to classrooms, was 1.90 bordering on minimally adequate. This factor had moderate impact on the learning environment. Factor 10: large flexible space and/or workstations are available to accommodate student projects was minimally adequate and had a moderate impact on the learning environment. Factor 4: Personal space in the classroom away from group instruction allows for privacy time for individual students, was perceived as minimally adequate with a moderate impact on the learning environment. However, there was a high level of variance in the responses to this

statement. The standard deviation was 1.91 which is an extreme standard deviation in this study. This indicated that respondents were not in agreement on their perception of the adequacy of this factor. Factor 5: Storage for student materials is adequate was considered minimally adequate with a moderate impact. What is noteworthy in this case is that there was very low variance in responses to this statement. Most respondents agreed that this was a minimally adequate factor. Telephones in classrooms had the highest adequacy mean of 3.31 and had a moderate impact on the learning environment.

Table 10 depicts response impact and adequacy means in descending order of impact means and corresponding standard deviations.

Table 10: Impact means and standard deviations in descending order of impact means with corresponding question numbers, adequacy means and standard deviations

Question	Impact Mean	SD	Adeq. Mean	SD
19	3.31	0.89	3.00	0.78
4	3.30	0.91	2.10	1.91
80	3.28	0.86	3.12	0.82
24	3.27	0.86	2.50	0.65
30	3.26	0.86	2.97	0.78
1	3.25	0.91	2.60	0.68
27	3.22	0.83	2.59	0.68
2	3.20	0.83	2.40	0.62
40	3.20	0.83	2.92	0.77
25	3.19	0.83	2.49	0.65
28	3.18	0.83	1.90	0.52
82	3.18	0.83	3.00	0.78
13	3.17	0.83	2.55	0.65
59	3.16	0.83	2.53	0.65
81	3.16	0.98	2.86	0.77
3	3.16	0.52	2.77	0.73
15	3.15	0.78	3.02	0.78
76	3.15	0.81	2.85	0.73
9	3.14	0.81	2.62	0.68
22	3.13	0.79	2.63	0.68
72	3.13	0.83	3.18	0.83

Table 10: Continued

Question	Impact Mean	SD	Adeq. Mean	SD
26	3.11	0.80	2.74	0.70
60	3.11	0.78	2.76	0.73
10	3.10	0.81	1.98	0.39
79	3.09	0.85	2.85	0.73
29	3.08	0.79	2.57	0.68
71	3.08	0.78	3.13	0.91
68	3.06	0.79	2.77	0.73
75	3.06	0.79	2.79	0.73
20	3.05	0.78	2.91	0.76
23	3.05	0.78	2.60	0.68
11	3.04	0.78	2.63	0.21
58	3.04	0.65	2.70	0.72
49	3.02	0.78	3.02	0.72
73	3.02	0.85	2.93	0.78
18	3.01	0.78	2.62	0.68
17	3.00	0.78	2.78	0.73
14	2.99	0.78	2.63	0.68
52	2.99	0.78	2.47	0.72
66	2.98	0.78	2.58	0.68
21	2.97	0.78	2.79	0.73
31	2.97	0.78	2.17	0.57
39	2.97	0.78	2.40	0.62
8	2.96	0.78	2.55	0.66
67	2.96	0.78	1.58	0.35
57	2.95	0.78	2.16	0.57
61	2.95	0.78	2.74	0.71
65	2.95	0.72	2.57	0.68
12	2.94	0.78	3.31	0.86
63	2.92	0.78	2.65	0.67
35	2.91	0.76	2.67	0.70
77	2.90	0.78	2.63	0.68
32	2.89	0.76	2.69	0.70
38	2.88	0.75	2.15	0.52
74	2.88	0.78	2.58	0.68
36	2.86	0.78	3.04	0.79
16	2.85	0.78	2.53	0.65
64	2.84	0.73	2.83	0.73
62	2.83	0.74	2.83	0.75
69	2.83	0.76	2.59	0.68
33	2.81	0.73	2.72	0.71
5	2.80	0.73	2.26	0.36
7	2.80	0.74	2.56	0.68
78	2.80	0.73	3.04	0.78
42	2.76	0.73	2.62	0.68

Table 10: Continued

Question	Impact Mean	SD	Adeq. Mean	SD
43	2.75	0.70	2.49	0.65
48	2.75	0.72	3.00	0.65
37	2.73	0.72	2.78	0.73
34	2.71	0.70	3.11	0.79
70	2.70	0.70	2.91	0.76
44	2.64	0.68	3.02	0.72
55	2.62	0.72	2.98	0.78
56	2.62	0.68	2.72	0.70
50	2.60	0.68	2.78	0.73
54	2.60	0.72	2.91	0.76
6	2.56	0.68	2.23	0.59
53	2.55	0.65	2.80	0.73
51	2.49	0.65	2.84	0.73
41	2.47	0.65	2.60	0.68
45	2.45	0.65	2.58	0.68
47	2.45	0.65	2.83	0.74
46	2.23	0.74	2.57	0.61

Impact scores are as follows: significant impact-4, moderate impact-3, minimal impact-2, no impact-1. Impact means varied from the highest score of 3.31 to the lowest score of 2.23. Standard deviations ranged from 0.91 to 0.65. In general, the trend that surfaces in terms of impact on the learning environment is that those factors with the highest impact have the highest standard deviation in response agreement and those having the least impact have the lowest standard deviation.

Table 11 depicts the factors with the highest impact means with corresponding high standard deviations. The fifteen factors that demonstrate this clearly are, in descending order of impact mean values: 19, 4, 80, 24, 30, 1, 27, 2, 40, 25, 28, 82, 13, 59, and 81.

Table 11: Fifteen facility factors with the highest impact means and corresponding high standard deviations

#	Statement	Mean	SD
19	Library/Media center provides appropriate space, occupies a space of 2,100 sq. ft., and acts as an instructional lab.	3.31	0.89
4	Personal space in the classroom away from group instruction allows privacy time for individual students.	3.30	0.91
80	Classroom rules and consequences are posted in each room.	3.28	0.86
24	Science program is provided sufficient space and equipment with science lecture-lab rooms a minimum of 1,000 sq. ft.	3.27	0.86
30	The media center is well equipped with computers.	3.26	0.91
1	Size of academic learning (classroom) space meets state standards (700 sq. ft.).	3.25	0.83
27	Room design for technology education maximizes the use of state-of-the-art equipment.	3.22	0.83
2	Classroom space permits arrangements for small group activity.	3.20	0.83
40	The school facility permits teachers to function as professionals.	3.20	0.83
25	Science lab equipment has been updated less than five years ago to meet current standards.	3.19	0.83
28	Space for small groups and remedial instruction is provided adjacent to the classrooms.	3.18	0.83
82	There are posters, mobiles or displays relating to topics being studied.	3.18	0.83
13	Classrooms have logical, well designed integrated technology systems.	3.17	0.83
59	Ventilating system provides adequate quiet circulation of clean air and meets Indoor Air Quality (IAQ) standard requirements.	3.16	0.83
81	Student and class accomplishments are highlighted in the classroom and throughout the building.	3.16	0.98

Each of these factors is perceived to have a moderate impact on the learning environment yet respondents varied greatly in their agreement that this was the case.

Figure 83 depicts the plot of adequacy means vs. impact means. Adequacy levels are on the Y axis and Impact levels are on the X axis. The grouping of points is surrounded by a polygon to accentuate the pattern of data points. As can be seen, the data points are grouped in a tight pattern around moderate impact and between minimal adequacy and moderate adequacy. This supports the data trends that show relatively low standard deviations across the impact and adequacy means. This visually and

graphically depicts the fact that most respondents agreed on what they perceived to be adequate facility factors and the impact that they have on the learning environment.

Two points are outliers. Factor 46 has the lowest impact on the learning environment but is moderately adequate. Statement 46, common space, classrooms, gymnasiums, cafeterias, library, media centers, computer labs and performing arts centers are available and used by the community for non-educational purposes, refers to community access to the common spaces in the subject middle schools. This suggests that the respondents understand that factors such as this have very little to do with the act of delivering instruction in the classroom. The factor with the lowest adequacy yet having a moderate impact on the learning environment is statement 67: The majority of classrooms have windows. The fact that subjects perceive this factor as being deficient and having an impact on the learning environment is supported by research on the importance of natural lighting in the learning environment by Schneider (2002), Kleiber (1973) and the Heschong Mahone Group (1999). All of these researchers found that, in fact, natural lighting has a major impact on the learning environment, student achievement, attitudes, and morale.

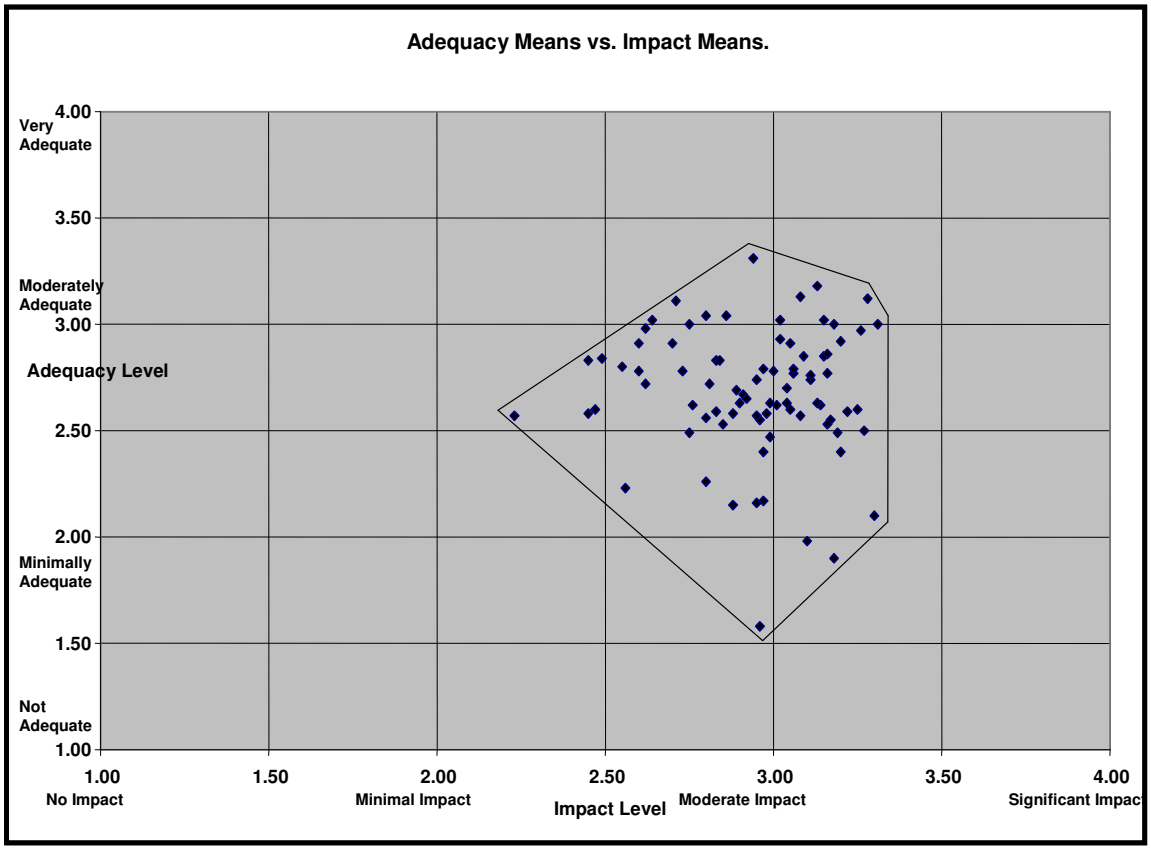

Figure 83: Adequacy means vs. impact means.

Educational Facility Adequacy is the extent to which the school meets the educational needs of a community and a school district (Hawkins and Lilley, 1998). The Educational Quality of a facility is the level to which the school supports the learning environment and educational programming. The Impact that a facility has is the influence that the physical aspects of a school have on the learning process.

In assessing the educational adequacy and quality, all TLEA questions are phrased such that any agree response indicates that the factor of that facility meets the educational need of the community and school district and that it supports the learning

environment and educational programming. Any level of disagreement to the statements indicates that the factor does not meet the educational needs of the community and school district and does not support the learning environment and educational programming. Eighty-nine percent of the 19,352 responses to the questions of educational adequacy and quality of these facilities were answered either agree or strongly agree. Eleven percent of the responses were answered either disagree or strongly disagree. There are nine areas in the middle school facilities that respondents perceived as inadequate. Respondents perceived inadequate facility factors in Questions 4, 5, 6, 10, 28, 38, 39, 57, and 67 Seven areas were part of the Educational Adequacy section of the survey and two were part of the Environment for Education section. Personal space in the classroom away from group instruction which allowed for privacy time for students was perceived as not adequate. Storage space for student materials was perceived as inadequate. Storage space for teacher materials was also perceived as not adequate. Large flexible workstations to accommodate student projects were reported to be not available and inadequate. Space for small groups and remedial instruction next to classrooms were reported to be not existent and inadequate. Individual teacher office space away from the classroom was perceived as not adequate. Teacher professional libraries were perceived as not available and not adequate. Respondents perceived that year around comfortable temperature and humidity were not provided and not adequate. Respondents perceived that natural lighting through the use of classroom windows was not provided and inadequate.

In assessing the perceived impact of the facility on the learning environment, respondents answered significant and moderate impact or minimal and no impact. Of the 19,352 responses to this question, 91% indicated that respondents perceived that the factors had a significant or moderate impact on the learning environment. Nine percent of the responses indicated that the factor had little or no impact on the learning environment. Respondents reported that they perceived no impact on questions 34, 36, 337, 41, 42, 43, and 53. Five of the responses were part of the Educational Adequacy section of the survey and two were part of the Environment for Education section of the survey. It was perceived that the appearance of administrative offices had little or no impact on the learning environment. The proximity of clinics to administrative offices and ability to meet requirements in the facilities was perceived to have little or no impact on the learning environment. The availability of work space and privacy for administrative personnel had little or no impact on the learning environment. Faculty, staff and visitor parking proximity and availability had little or no impact on the learning environment. Suitable reception space had little or no impact on the learning environment. Meeting rooms for parents and volunteers had little or no impact on the learning environment. The landscaping of the school site and around the building had little or no impact on the learning environment.

Research Question Two

Research question two states: What is the quality and educational adequacy of middle level educational facilities in Humble ISD as determined by the CEFPI Guide for Facility Appraisal Instrument for Middle School Appraisal (Hawkins and Lilley, 1998)?

This question is answered using the instrument developed by Dr. Hawkins and Lilley in cooperation with the Council of Educational Facility Planners (CEFPI). The purpose of this question is to quantitatively measure the quality and educational adequacy (effectiveness) of the middle school facilities in Humble ISD as determined by a disinterested team of observers. The team was composed of this researcher, who, at the time was not an administrator on any of the campuses being reviewed. The second team member is a district level construction manager, who, at the time of this study, had been an employee of the district for less than six months and was unfamiliar with the six middle school facilities being studied.

Research question two is addressed by six sections on this instrument, two of which directly correspond to the TLEA instrument (sections 5 and 6). Each section is weighted with maximum possible points for each section as follows: Section 1: The School Site (10 items)=100, Section 2: Structural and Mechanical (18 items)=200, Section 3: Plant Maintainability (9 items)=100, Section 4: School and Building Security (20 items)=200, Section 5: Educational Adequacy (23 items)=200 (TLEA=188), Section 6: Environment for Education (17items)=200 (TLEA=140). The maximum score that a facility may receive from this instrument is 1,000. The percentage rating is assigned to each section by dividing the total number of points for that section by the possible number of points for the section. The percentage ratings are then averaged to determine the overall percentage rating of educational adequacy and quality of each campus. From the table of scores on page MS-4 of the instrument, the

following rating is determined: 1-29%=very inadequate, 30-49%=poor, 50-69%=borderline, 70-89%=satisfactory, 90-100%=Excellent.

In determining the validity of this instrument, the researcher interviewed Dr. Hawkins telephonically. No pre-testing or field-testing was conducted in the preparation of this instrument and it was not developed as part of a research project. Dr. Hawkins and Lilley produced the instrument out of necessity for a widely useable and applicable instrument by architects. Educational facility architects and experts in the field who were considered the authority base at that time reviewed the instrument. Dr. Lee Burch, an educational facility architect conducted research with Dr. Zellner and Brown using the CEFPI instrument. Dr. Burch indicated in an interview that their team established that content validity was reached through the repeated use and accepted validity by hundreds of experts in the field of educational facility design and construction over decades of application. Validity is defined by RA Zellner: "A measure is valid if it does what it is intended to do. Alternately stated, an indicator of some abstract concept is valid to the extent that it measures what it is purported to measure." (Keeves, 1988, pg. 322). Through the extensive use of this instrument over a period of seven years, content validity has been achieved. The appraisal process achieves appropriate reliability through the development of a team consensus for each item. Training and experience in appraisal of facilities has led to team consistencies within a 10% variance (Hawkins and Lilley, 1998).

As part of the quantitative assessment of each middle school's educational adequacy and quality, several other factors must be included. The building location,

community description, educational setting, curricular programming, district and school philosophies, and demographics are all integral parts of this assessment (Hawkins and Lilley, 1998).

School and Community Locations

Humble ISD is a district with 29,000 students, 2,000 employees, and 32 schools. It is divided roughly into North and South halves by the San Jacinto River. Highway 59 marks the Western boundary, Beltway 8 marks the Southern boundary, Lake Houston is the Eastern boundary, and the Northern boundary is marked roughly by the intersection of the San Jacinto river and Highway 59 North. Three major thoroughfares feed the community from Highway 59 Eastward to a major North-South road along the East boundary of Lake Houston, Lake Houston Parkway. These 6 thoroughfares from North to South are: Northpark Drive, Kingwood Drive, FM 1960, Will Clayton Parkway, Atascocita Road, and Beltway 8. Three middle schools serve each side of the river. Atascocita, Humble and Timberwood (AMS, HMS, TMS) Middle schools are in the South and Kingwood, Creekwood, and Riverwood (KMS, CMS, RMS) Middle schools are North of the river. The master-planned community of Kingwood lies north of the river and is fed by Kingwood and Northpark drives. KMS is one mile north of Kingwood Drive, CMS is on Lake Houston Parkway, and RMS is on Kingwood Drive. Humble City proper is on the South side of the San Jacinto at the intersection of FM 1960 and Highway 59. HMS is on Atascocita Road, TMS is .5 miles south of FM 1960 and AMS is on Lake Houston Parkway. (Humble ISD Homepage, 2006).

Community Description

Kingwood and Forest Cove, north of the San Jacinto River are master planned, residential communities that were developed by the Friendswood Corporation from 1962-1972 through the present day. The population of these two subdivisions is approximately 65,000 and is primarily white. They are subdivision type communities with homes ranging from $70,000 to $3 million. These two subdivisions are nearing "built-out" status and are reaching population stabilization. Culturally within Humble and surrounding towns, these communities are considered affluent and well-to-do. Average household income is $101,000. Humble city proper and the surrounding communities have been developing from 1906 to the present day. The City of Humble and surrounding subdivisions, unlike Kingwood and Forest Cove to the north, consist of very diverse demographics and housing types. The average household income is $61,000 with a population of 75,000. The combined population of the two areas is 140,000 (Humble Chamber of Commerce homepage, 2006).

Educational Setting

KMS, CMS, and RMS house approximately 3,000 students while AMS, HMS, and TMS house 3,400 students. Each school has grades 6-8 and offers identical middle level curriculum. These classes are Math, Science, English, Social Studies, Fine Arts, Visual Arts, Industrial Arts, Athletics, and Technology Courses. TAKs scores for the campuses are as follows: Recognized-RMS, Acceptable- AMS, CMS, KMS, TMS, and Unacceptable-HMS. The average percentage of economically disadvantaged students at AMS, HMS, and TMS is 35%. The average percentage of economically disadvantaged

students at CMS, KMS, and RMS is 6%. Commensurately, the number of AP and GT offerings in the above courses is higher at these three schools. Furthermore, student academic performance expectations, and community expectations are more rigorous at these three schools. The district strives to foster a learning environment that is characterized by a strong sense of academic emphasis and a maximum of time-on-task. A high degree of professionalism among employees and an ongoing recognition of student excellence contribute to the environment. The district emphasizes a strong school and community partnership (Humble ISD homepage, 2006).

Graphic representations of the results from this instrument will again be utilized in the form of tables which display the results from the evaluation of each campus.

Figure 84 depicts the cumulative scores for each campus in the study as reported by the survey team.

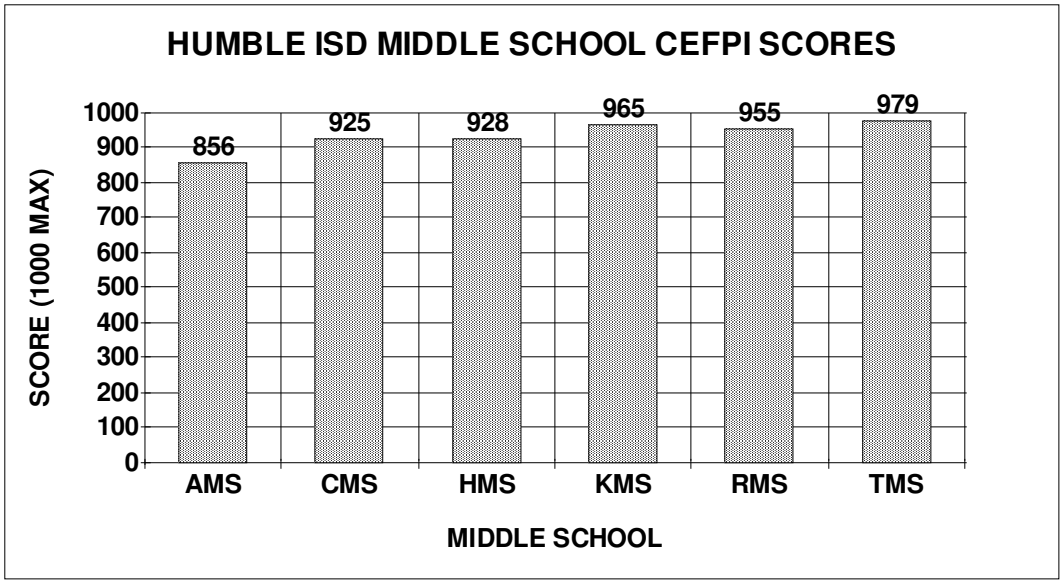

Figure 84: Cumulative CEFPI survey scores for 6 HISD middle schools

The instrument uses an additive scoring method, with each item having a maximum number of allowable points. The maximum building score is 1,000 points divided among six areas. The maximum for each section is as follows: The School Site=100, Structural and Mechanical=200, Plant Maintainability=100, School Building Safety and Security=200, Educational Adequacy=200, and Environment for Education=200. All buildings are of the same construction, concrete frame, brick façade, and concrete slab on grade. Each campus utilizes gas and electric cooling and heating systems through a central system. All of the schools have band halls, choir rooms, orchestra rooms, amphi-theaters, wood and metal shops, main gyms, cafetorium, girls and boys locker rooms, five lane track, small student commons area, libraries, two to three computer labs, home economics rooms, external court yards, student lockers, bus ramps, faculty parking, guest parking, and bicycle parking. All of the building's classrooms have collapsible classroom walls on two sides. This allows four classrooms to adjoin into one large room. Each campus has a common teacher lounge and work room and five departmental planning rooms. Every school has a foyer, administrative suites, counselor suites, clinic, and attendance office. As for computer support, every classroom has two or more computers and a teacher computer. All computers and buildings are inter and intra-net connected. All campuses have fire alarms, smoke detectors, intruder motion alarms, and surveillance camera systems. Five of the schools, AMS, CMS, HMS, KMS, and RMS have nearly identical floor plans. TMS, the newest school, utilized a completely different floor plan. All six schools are surrounded by residential areas and are at the

corner of two residential type roads. Five of the schools received an "Excellent: 90-100%" score and one had a "Satisfactory: 70-89%" score.

Atascocita Middle School, built in 1983 had the lowest cumulative score of the six buildings. The oldest campus is Kingwood Middle School, built in 1977. The primary cause for this score was the condition of the school at the time of evaluation. Specifically, the campus is undergoing renovation and suffers from the detractors of temporary walls, equipment on site, and a disrupted learning environment. Additionally, the school faces a two lane residential road, Lake Houston Parkway, which has become a major artery to new subdivisions in the south of the district and Beltway 8, a major hub of the Houston Metroplex. As a result, the road is congested and campus access is severely restricted and dangerous for children. Additionally, the campus was initially designed for 1,100 students and now houses 1,500 students. Several businesses have been built directly across the street within 70 feet of the main school entrance. This has added to the congestion around the campus and detracted from the aesthetic qualities that the other five campuses enjoy.

Timberwood Middle School received the highest cumulative score of the six buildings. It is the newest of the buildings and has a very different floor plan from the other middle school facilities. At the time of the evaluation by the survey team, TMS was not undergoing construction. It was built in an established neighborhood with no room for commercial construction on its flanks. A two-lane, divided residential road runs in front of the campus and sidewalks feed the campus on both sides of this road. Facility planners were careful to include 100 yard, forested green belt on the south and

north sides of the campus. The building is designed to create a school-within-a-school setting which allows for the separation of 6th graders from 7th and 8th graders. The curbside appeal of the building has a large impact on visitors and users. It is a very attractive building with columns and archways lining covered entrances to faculty and visitor entrances. The main external entrance is topped by a false bell tower. The entrance foyer into the building is also lined with archways which lead to a very large, naturally lit commons area.

Kingwood Middle School had the second highest score of the six facilities. The interesting point about this building is that it is the oldest of the six middle school facilities at 28 years. The floor plan for this building was the model for all of the campuses except TMS. This campus was renovated two years ago and in essence is a new building inside and out. It is surrounded on three sides by mature forest giving it a very appealing setting.

Figure 85 depicts the scores for each campus on Section 1: The School Site, as reported by the survey team.

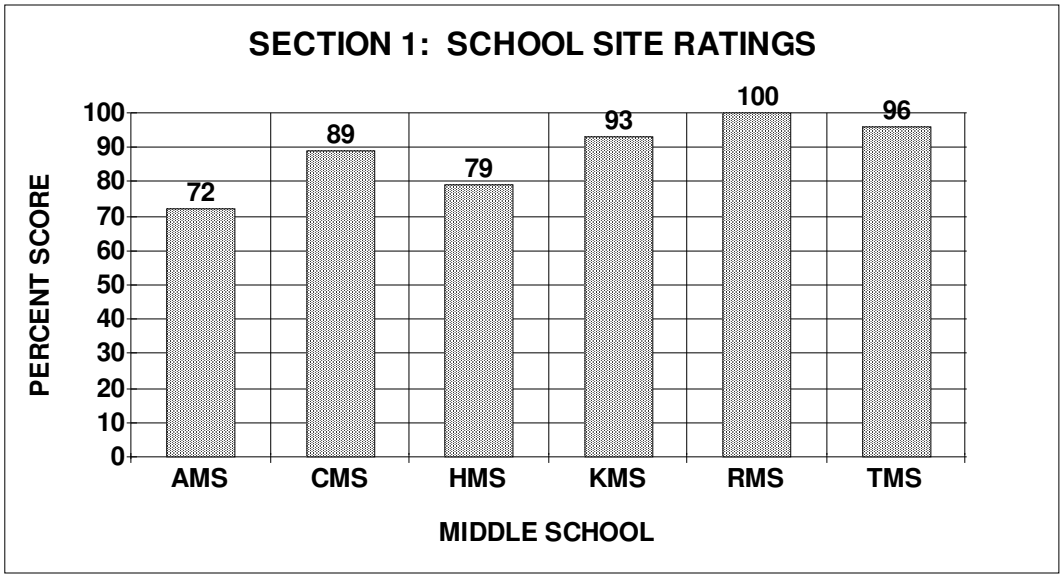

Figure 85: CEFPI section 1 scores by campus: The school site.

The school site involves much more than the location of the building. The physical setting of the campus is an integral part of the school facility and the foundational tool for establishing an educationally adequate and high quality learning environment. Educational programming and community functions will be enhanced or limited by the adequacy of the school site. Educational facility planners must take great care when selecting and developing the school site. The selection process must allow for and consider the character and philosophy of the school district and the requirements of the educational programming (Hawkins and Lilley, 1998).

Riverwood Middle School is clearly exemplary in this area. The site is surrounded on four sides by mature pine forest and the color scheme of the building is burnt orange and green which nearly matches the color of the surrounding forest. A green-belt bicycle trail runs behind the building and connects to surrounding

neighborhoods. It feeds directly to student bicycle parking areas. The acreage for this campus exceeds state requirements and the grounds have been developed with the community in mind. Unique to this campus are two football fields, one with soccer goals, tennis courts, sand volleyball courts, softball field, newly surfaced track, track and field facilities, and outdoor classroom facilities. The site is very easily accessed from four directions and has no undesirable businesses, traffic, industry, or natural hazards. In fact, the campus sits next to a 100 acre wildlife preserve area. The landscaping and topography is superior to other campuses. There is surplus parking for faculty, staff, and visitors. The visitor parking entrance and child pick-up area has a double loop to allow for easy ingress and egress. Across the street from the campus is a fully equipped, full time fire department. This adds to the safety and community feel of the campus. The school site for this campus is exemplary and one which should be emulated in this district and others.

Figure 86 depicts the scores for each campus on Section 2: Structural and Mechanical Features as reported by the survey team.

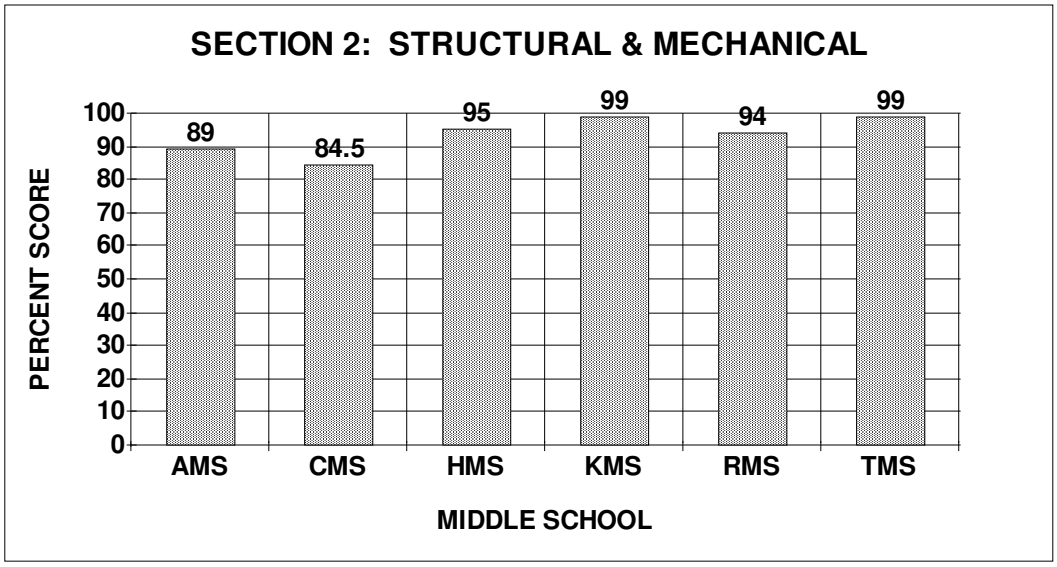

Figure 86: CEFPI section 2 scores by campus: Structural and mechanical features.

Structural and mechanical features are critical to all functions of the school plant. These features impact the future maintenance costs, capability of expansion, and feasibility of modifications to meet increasing educational program needs. The basic design of electrical systems, water and waste disposal, and heating, ventilation, air-conditioning (HVAC) must have sufficient capacity to meet present or future needs. Most of these design requirements must meet current building codes and state construction requirements (Hawkins and Lilley, 1998).

Two campuses had the highest score of 99 in this section. Ironically, they are the newest and oldest middle schools. KMS at 28 years and TMS at 7 years achieved the highest scores primarily because they were renovated and constructed, respectively, under the most current building codes, Americans with Disabilities Act (ADA)

requirements, and Uniform Federal Accessibility Standards (UFAS). These requirements impact all areas of these campuses including but not limited to doors, floors, restrooms, ramping, parking spaces, hallways, and special areas. The structural features of both campuses achieved the highest scores of the six campuses. Barrier-free access to all areas for handicapped persons was present and exceeded the expectations of the survey team. Roofs and foundations were in excellent condition and showed no signs of drainage problems or cracking. Exterior and interior walls were free of deterioration and had sufficient expansion joints. The building envelope was conducive to high energy conservation in both facilities. Mechanically, both buildings attained the highest possible points in all areas. KMS had one shortcoming in the area of sufficient electrical outlets for technology applications. Both buildings had more than adequate light sources that were well maintained and was reflected in the bright, "cheerful" feel in the building. Internal water supply systems, drinking fountains, and restrooms all met the highest standard in these two buildings. Due to the recent renovation and construction in both buildings, fire alarms, smoke detection, sprinkler, and surveillance systems were in excellent condition.

Creekwood Middle School had the lowest structural and mechanical score of the six middle schools. CMS had several entrances and doorways that did not meet all barrier free requirements set forth by ADA and UFAS guidelines. Unlike the two high scoring campuses, CMS showed evidence of roof leakage in several places throughout the campus. Mechanically, CMS had deductions in several score areas. The most significant and visually striking problem is the dim lighting throughout the campus. The

two high scoring campuses have three bulbs to each light fixture whereas CMS has one bulb per fixture. This creates a much darker setting than KMS or TMS. CMS did not have enough wall outlets for technology applications, phones, or computers. Drinking fountains and restrooms also did not fully meet standards and were just satisfactory.

Figure 87 depicts the scores for each campus on Section 3: Plant Maintainability as reported by the survey team.

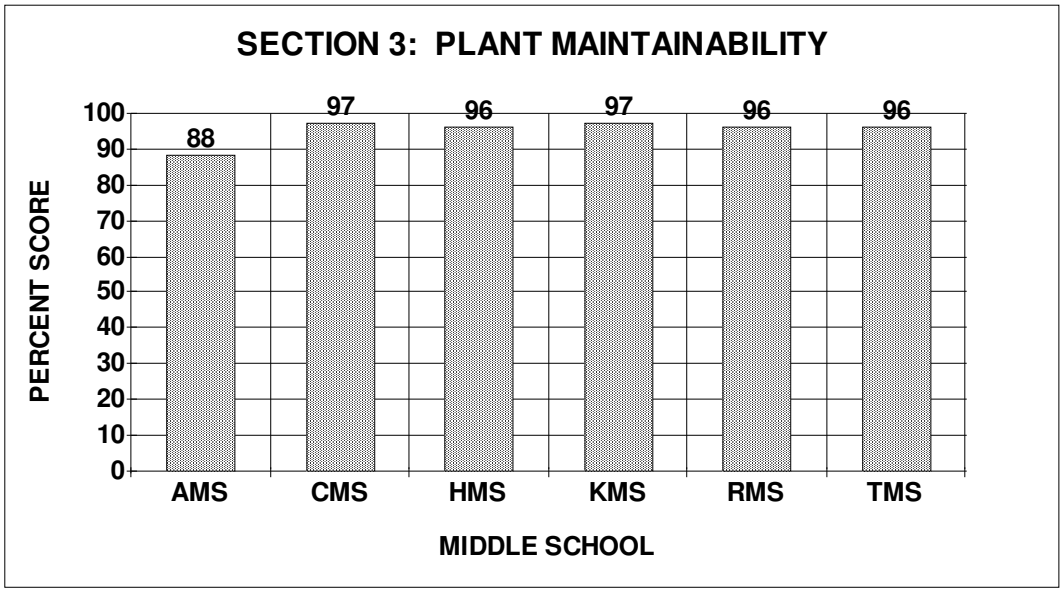

Figure 87: CEFPI section 3 scores by campus: Plant maintainability.

Maintainability refers to the aspects of a facility that make it possible to extend the life of the building at a reasonable cost. Characteristics of a building that contribute to high maintainability are design, construction materials, durability of fixed equipment, floor coverings, interior wall and ceiling materials, hardware, and fixtures. The emphasis is on the quality of the building rather than the scheduled maintenance and

routing care of the facility. Because many of these aspects are built into the building at the time of construction, careful decisions must be made about building and construction quality compared to cost at the time of construction or renovation. In terms of preservation, school districts have the responsibility to maintain their facilities as nearly as possible to their original state (Hawkins and Lilley, 1998).

CMS, KMS, HMS, TMS, and RMS all received "Excellent" scores in terms of the maintainability of these buildings. AMS, however, scored the lowest of the six campuses with a score of 88 which is "Satisfactory". The windows at AMS were "borderline" in quality and finish by the CEFPI criteria. Interior walls which are included in this item had great need for re-painting. Much of the surface area was chipped and faded. Floor surfaces and expansion joints showed signs of heavy wear and in some locations were chipped and cracked. Ceiling tiles throughout the building were stained, cracked, and water stained. Electrical outlets and power to permit routine cleaning were not available in every area of the building. There were several high scoring areas in this section at AMS. Built-in equipment such as counters, cabinets, shelving, and chalkboards were in good shape for the age of the building. Kitchen, cafeteria, and laboratory areas are constructed from solid, durable material and maintain a good finish for the age of the building. All door locking fixtures and handles were also made of highly durable material and were in excellent shape. Restroom fixtures such as plumbing, sinks, lavatories, urinals, and stall partitions were in excellent shape.

All six campuses had low scores on custodial storage space. Custodial closets require a minimum of 36 square feet, shelving for storage of materials, and space for

hanging cleaning implements. Ideally, custodial closets are located near clusters of classrooms and near the middle of the building, wing, or section. In each of the six buildings, these aspects were lacking in size, number, and location. Additionally, all campuses were deficient in the number of electrical outlets provided for routine cleaning throughout the building.

Figure 88 depicts the scores for each campus on Section 4: Building Safety and Security as reported by the survey team.

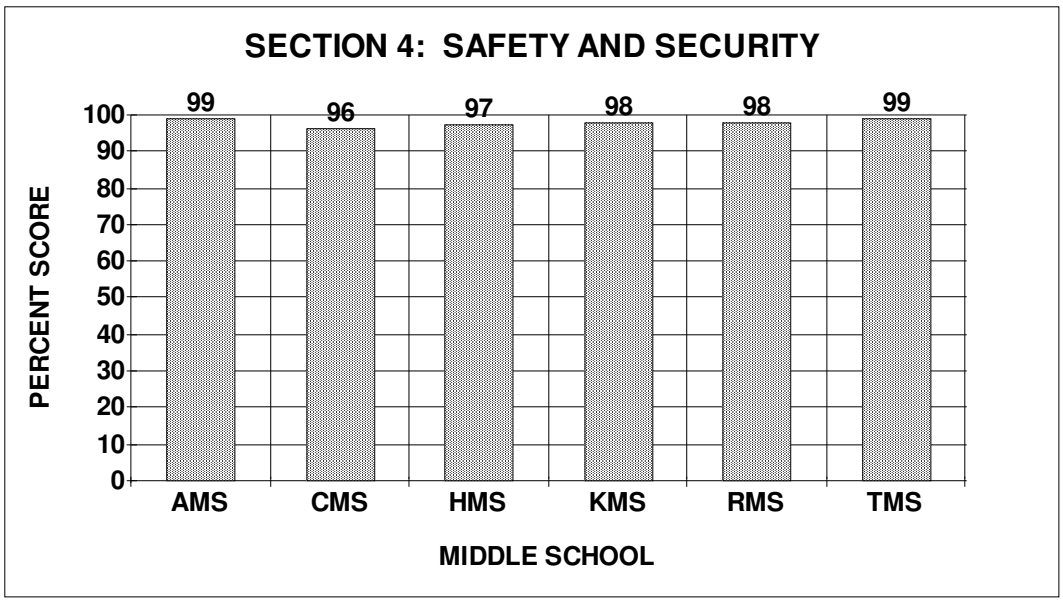

Figure 88: CEFPI section 4 scores by campus: Safety and security.

All school facilities must be maintained in the safest possible condition. Students, employees, and visitors should expect that their well-being is protected and paramount whenever they enter or use school facilities. Safety hazards in schools may

relate to site location, selection of building material, building design, and poor operational practice. Security inside, outside, and around the perimeter of the building is critical to providing uninterrupted operation of school programs (Hawkins and Lilley, 1998). This section of the instrument has three subsections: Site safety, Building safety, and Emergency safety. In the Safety and Security section, all campuses scored in the "Excellent" range.

On all six campuses bus loading areas are separated from other vehicular traffic which can provide the maximum safety for students. All campuses have several sidewalks that lead to and from the loading areas. The only detractor from excellent scores in this area is the proximity of playgrounds and bicycle racks to the bus ramps. In some cases, students pass through the bus loading areas to reach these areas.

All the schools with the exception of AMS have multiple sidewalks on and off campus. All the sidewalks observed on campuses meet width requirements and are obstacle free. At all six campuses there are ramps that meet accessibility requirements while KMS and TMS excelled in this area. Clearly marked crossing zones are lacking at most of the campuses.

Approaches to all six schools are clearly marked with flashing school zone signage. Pedestrian crossing signage is also evident although, marking on the pavement is missing or unclear at the campuses. Vehicular traffic on all six of the campuses is a detractor. In each case, vehicles are not clearly controlled or monitored during dismissal times at the campuses. This creates a hazardous situation for children at most of the campuses.

Each of the middle school campuses has very little exposed or standing athletic equipment. What exists is primarily football blocking sleds. These are stored properly and are in good condition. Bleachers are present at several of the campuses and all are in excellent condition.

On all six campuses, heating and cooling units are housed in air handling rooms or are on the roofs of the buildings. Exterior doors open outward and are equipped with panic hardware. Each campus has security systems to provide uninterrupted educational programs. This includes emergency lighting connected to diesel generators in case of power outage. All campuses lost points and were "borderline" in the area of classroom doors. In order to facilitate evacuation, classroom doors should open outward and be recessed into the wall. This was not the case at all six campuses.

All flooring is maintained in a non-slip condition. The flooring at all six campuses is durable terrazzo with a high gloss wax finish. If left wet, these floors are very hazardous and can contribute to the leading cause of accidents: slips, trips and falls. All fixed projections such as water fountains, do not extend more than eight inches form corridor walls on all six campuses. Traffic areas on each campus terminate into an exit leading to the exterior of the building.

Properly maintained and inspected fire safety equipment is properly located at all six campuses. Fire resistant materials are used throughout each of the facilities. Automatic and manual emergency alarm systems with sound and lighting systems are provided and in excellent condition. There are at least two independent exits from any point in each of the facilities. Each of the middle school campuses is inspected yearly by

the city or county fire marshal and must meet strict criteria to meet occupancy requirements. Hence, Building Safety and Security is a strong point for all of the campuses.

Figure 89 depicts the scores for each campus on Section 5: Educational Adequacy as reported by the survey team.

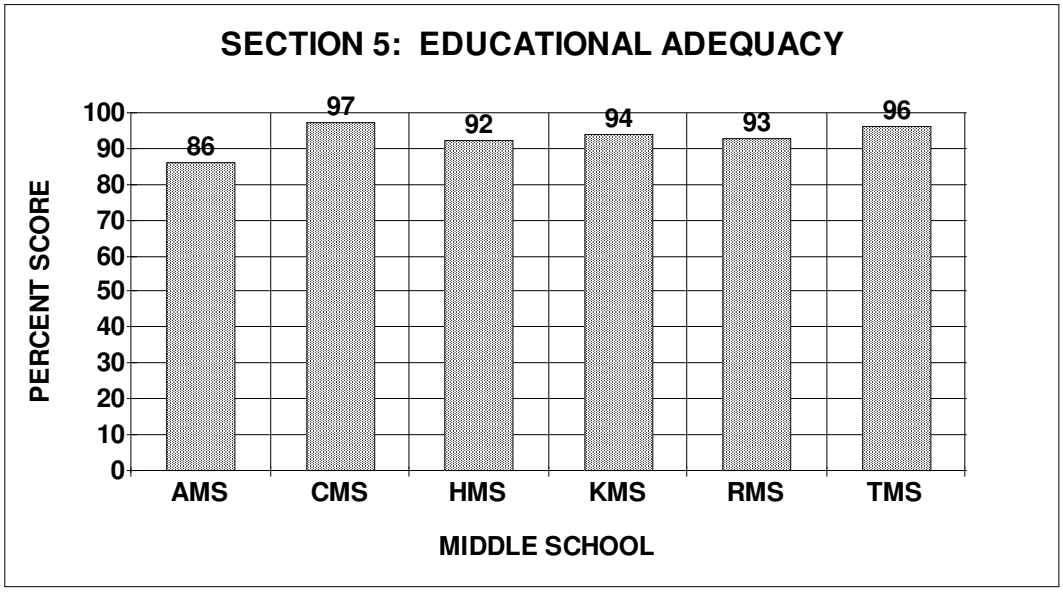

Figure 89: CEFPI section 5 scores by campus: Educational adequacy.

The primary purpose of the appraisal process is determining educational adequacy of school buildings. Maintaining a high level of educational adequacy is critical because schools exist to serve the educational needs of the community, the students, and the district. Ultimately, the determination of the educational adequacy of a school building is derived from the relationship between educational programs and the physical structure (Hawkins and Lilley, 1998). The physical structure is formed by the

relationship between the architectural facility and the surrounding environment (Loughlin, 1982). The learning environment provided by the school building will detract from or enhance the instructional program. The very center or focal point of the learning environment and where instructional delivery takes place is the classroom. It is the physical embodiment of the learning environment (Black, 2001). It is here that the educational adequacy of the building is determined. In this section, measurement is categorized according to academic learning, specialized learning, and support spaces. The quality and quantity of learning spaces is the focus of determining the facility adequacy (Hawkins and Lilley, 1998).

Five campuses scored in the "Excellent" range on this section. AMS however, scored the lowest in this section. As noted earlier, AMS was undergoing renovation at the time of the evaluation process. Although the campus earned a score of 86%, which is satisfactory, there were several areas that had borderline scores which are presented below.

All six campuses received deductions for the size of their academic learning spaces. The recommended, "excellent" size for classrooms at the middle school level is 850 square feet or 20 x 40 feet. Most classrooms observed were 720 square feet or 24 x 30 feet dimensions.

Every campus received the highest score for classrooms having space for small group activity. This factor allows for cooperative learning and group work. Every classroom should have an alcove or corner where 3-5 students can gather for group

work. Each campus has flexible walls between four rooms which allows for this process to occur.

All campuses earned the highest allowable score for learning areas being near related educational activities away from disruptive noises. Children require much higher acoustical quality than do adults in order to attain good speech acquisition for maximum comprehension (Lyons, 2002). As per the recommended separation from noisy areas, all classrooms are isolated from music classrooms and industrial shop classes (Hawkins and Lilley, 1998).

All six campuses received deductions in the area of personal space allowing for privacy time for individual students. Students need the ability to separate themselves from the instruction and activities of the total class. It is recommended that alcoves and study carrels be provided for this to take place. All campuses received a "borderline" score for this deficiency.

Students have a surplus of storage space for their materials on each of the campuses. Lockers for every student are provided. Teacher storage space for personal items is limited and received a "borderline" score on all of the campuses. Teachers should have a cabinet or wardrobe of sufficient height to accommodate a full length coat. Shelving should be provided and any storage area should be lockable. In addition to this space, teachers should have sufficient storage for teaching supplies (Hawkins and Lilley, 1998).

Specialized learning areas include but are not limited to remedial classes, speech and journalism classes, special education classes, computer classrooms, and any

discipline type classrooms. The recommended square footage for all grade levels is 25 to 30 square feet per student (Hawkins and Lilley, 1998). All of the campuses except TMS, the newest school, received one to two point deductions for shortages in these areas.

The design of specialized learning areas should be compatible with the instructional program that they serve. Specialized learning areas should be designed for the programming they support. Campuses often transform instructional rooms unfit for the programming in an attempt to support developing special needs. All campuses except AMS received excellent scores in this area. AMS had deductions here due to the adaptation of older rooms that were not suitable for the new programming desired.

The Libraries in RMS and TMS received excellent scores. Their design and décor, which play a major factor in this space, were conducive to learning appropriate activities. The four remaining campuses received minor deductions because their libraries were drab and sparsely decorated. Gymnasium and outdoor facilities at all six campuses are in excellent condition and serve physical education programs and instruction well. All campuses received a maximum score in this area. All science programs are well supported by the facilities at each of the six middle schools. Classrooms, laboratory spaces, and teacher preparation spaces are provided and received the maximum score for adequacy.

All the campuses have similar and excellent music facilities. Orchestra, choir and band spaces are all sound treated. Acoustical treatment is provided on walls and

ceilings. Adequate storage is provided for instruments and other musical equipment. All campuses received the maximum score in this area.

Each of the campuses also has satisfactory art classrooms. They all were appropriate for instruction. There is ample storage for supplies and equipment in a connecting art supply area at each of the campuses. The campuses received excellent scores in this area.

All of the campuses have two or more, well equipped, inter and intra-net connected computer labs. State of the art equipment is used and there is ample equipment and space for student use. All campuses received deductions to the satisfactory level except TMS. This campus had computer rooms designed specifically for the campus. The others transformed existing rooms into computer labs which detracted from the adequacy of the facilities.

AMS, CMS, KMS, RMS, and TMS received excellent scores for their teacher's lounges and work rooms. These areas support the teachers in these buildings as professionals. HMS received a borderline poor score for their teacher lounge and workrooms. The amount of space, furnishings, access to supplies, telephones, and computers is lacking in this building.

In middle schools, every effort should be taken to create a non-institutional environment in cafeterias. These areas are more inviting if the walls, ceiling and floor provide a decorated effect. Color and arrangement of tables in the dining area makes a great difference in the creation of a desirable atmosphere. AMS is the only campus that

received a borderline poor score in this area. Many of the above attributes were missing or limited in this facility.

The administrative offices set the tone for the appropriate operation of the building. There should be signage to indicate where counselors, principals, attendance and registrars are located. All of the middle school campuses have taken measures to exceed these expectations. All of the campuses have decorated, furnished, and labeled their administrative offices and therefore earned excellent scores.

At the middle school level, counselor's offices should provide privacy and some form of reception area. Conference rooms and storage areas are crucial for adequacy in this area. The six middle schools have achieved this level of quality in their counseling areas. Each has a moderate reception area and children can meet with their counselor in privacy. The campuses received excellent and satisfactory scores in this area.

The clinic should be located near the principal's office and have at least 500 square feet for students needing attention or medication. Restrooms, privacy rooms, and access to water are essential. AMS and CMS received minor deductions in this area due to the small size of their facilities. The other campuses received excellent scores.

Campuses must have a lobby or foyer in the administrative areas. This area also sets the tone for the building and allows visitors to avoid heavy student traffic during passing times. All of the campuses except AMS received excellent scores in this area. They have decorated foyers with comfortable furnishings. AMS was lacking in this area and the proximity of construction to the foyer detracted greatly from its adequacy.

Administrative offices usually comprise at least a principal's office**,** a secretary's office and a reception area. The administrative suite should be well lit and attractively decorated. Adequate privacy areas, conference rooms, storage, restrooms, and records storage are required. AMS was deficient in this area again due to the construction very close to the administrative offices. The other five campuses had very professional, business-like administrative office suites.

Figure 90 depicts the scores for each campus on Section 6: Environment for Education as reported by the survey team.

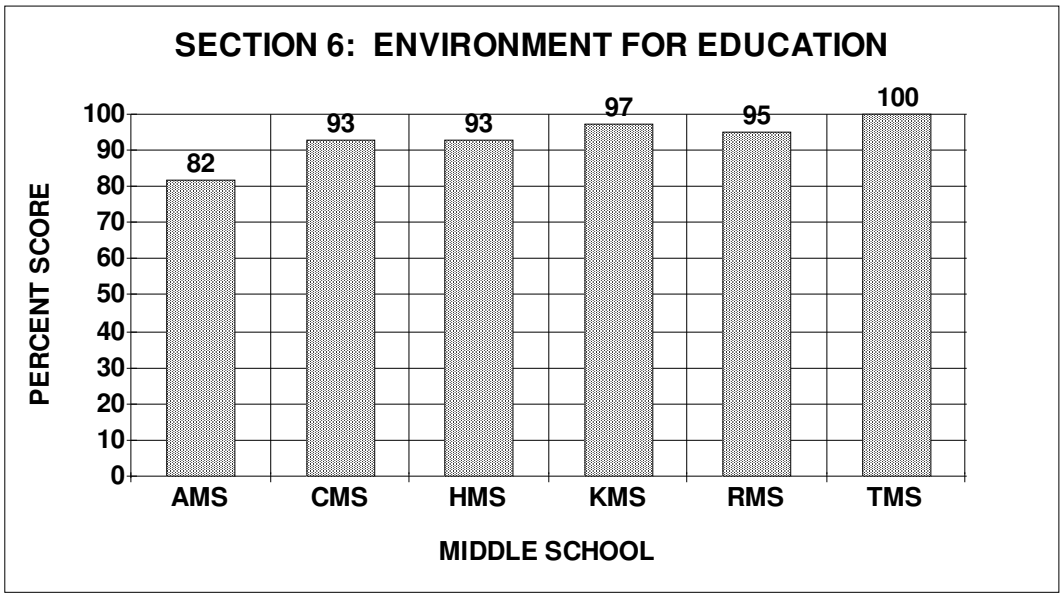

Figure 90: CEFPI section 6 scores by campus: Environment for education.

Research has proven that an adequate and high quality physical environment improves learning and the learning environment. The lasting impression that one gets from a building is often the first one as they enter a building. This initial impression

must be a positive one and is influenced by the sum of the factors that create the physical environment. The educational facility must look inviting to students, parents and faculty and the inside appearance must be conducive to learning. In most cases, a positive reaction to a building is created by a pleasing combination of factors rather than isolated items. The physical environment of a school is created by the relationship between the exterior and interior conditions. The most influential factors are physical comfort, ease of movement, and aesthetic qualities. A significant indicator of a building's quality is whether students and teachers use the facility at times when they are not required to be there (Hawkins and Lilley, 1998). All of the campuses except AMS received excellent scores in this section. TMS and KMS, the newest and oldest schools received the highest scores due to the very attractive appearance they present upon approaching the campuses. Landscaping and building orientation direct attention to the front of the schools, each of which is in excellent condition. This section is divided into the exterior environment and internal environment for education.

Architects should try to fit the building to its surroundings. Placement on the site is critical to the overall image of the building. This orientation affects the first reaction one has, especially upon approach to the building. Items such as parking lots, dumpsters, kitchen entrances, and mechanical yards are obviously not located in the front of the school. The elevation of the building is also a contributing factor to first impressions. These factors were deficient at AMS which received a borderline score. The orientation of the building on the property directs attention to the back entrance of the school. This is the faculty entrance to the school, storage area for industrial arts, and

dumpster storage. These factors detract greatly from the aesthetically pleasing design of the building. The other campuses received excellent scores in this area.

Landscaping contributes greatly to the appearance of the school. Adequate landscaping help the school to look finished. Trees and shrubs should be planted to provide a park-like appearance. A well manicured lawn also adds to a positive appearance. In addition to appealing to the users, a well landscaped school is a major public relations tool for the school district. CMS, KMS, RMS and TMS all have excellent landscaping on their campuses. Each has manicured lawns, attractive plantings, and surrounding trees. Each of these campuses truly has a park-like appearance. HMS and AMS on the other hand were borderline poor in this area. They were lacking any plantings, had very few trees around the campus, and lawns were unkempt.

The learning environment will exist at a higher quality if exterior noise and other distractions are limited. All of the campuses received excellent scores in this area. None of the campuses is located next to or near industrial type facilities and are all very quiet during school hours.

Protection from the elements in the form of covered walkways and entrances are critical, especially in this area. Any public building, especially schools, which serve the public in this manner, will have a positive impact on the users. All of the campuses except KMS received excellent or satisfactory scores in this area. KMS has no covered walkways or covered entrances except for small alcoves at the main entrance. For this reason, KMS received a borderline poor score in this area.

The learning environment is affected by the type and texture of the materials used to construct the building. Wood, concrete block, cement, or brick each can impact the desirable appearance of the school. Color and texture also have an impact on the appearance of the school. A psychologically warm climate should be presented by these factors. AMS was deficient in this area. Monotone colors, faded and stained brick and an overall drab appearance caused this score to be borderline poor. The other campuses had satisfactory and excellent scores in this area.

Color has a definite effect on the occupants of classrooms and other interior spaces in a building. A feeling of warmth with colors such as red, yellow, and orange, accompanied by rich brown furnishings has a great impact on the learning environment. The lines and shapes of furniture also impact the learning environment at the psychological level. Stimulating graphics on large wall spaces also contribute to a positive feel on a campus. All of the campuses except AMS received excellent and satisfactory scores. AMS received a "poor" rating in this area. This is due primarily to the cold and unattractive color schemes of the walls inside the building. The primary color used is sky blue with glazed finished on cinder block texturing. This gives the interior a very bland appearance.

Properly maintained temperatures within the learning environment are critical to a comfortable learning environment. Any time that a person is conscious of the room temperature it is not appropriate for the needs of the individual. Distraction caused by thermal discomfort impacts children at the most basic level (Chan, 1996). Therefore, a comfortable range must be achieved. The best temperature range for the learning

environment is 68-74 degrees (Schneider, 2002). All of the campuses received excellent scores in this area. The district maintenance department is very rapid in their response to temperature variance and adjusts building temperature remotely.

Related to air temperature is the movement of fresh air into classrooms. A minimum of 15 cubic feet of fresh air per student minute is adequate for a normal classroom. This must be provided in a quite manner. This is accomplished in these buildings with enclosed air handling systems. All of the campuses received excellent scores in this area, again, due to the rapid response of maintenance processes.

Many studies have been conducted on the importance of lighting in the learning environment. The conclusions of these studies show that appropriate lighting improves test scores, reduces poor behavior, and plays an important role in student achievement. Lighting even affects biological, metabolic, and psychological functions in children (Lackney, 1994a). CMS was the only campus to receive a borderline score in this area. This is due to the lighting arrangement in this school. All of the fluorescent fixtures in this school have one cylinder as compared to three in the other five schools. Therefore, CMS has a much darker internal learning environment which detracts from the learning environment.

The location and number of water fountains in a building can influence the learning environment. This is a very basic need that can detract from the environment if lacking. All of the middle school campuses in this study received excellent scores in this area.

Young adolescents require a social component in their learning environments. The physical learning environment must enhance the capability of students to interact and improve social relationships with their peers (Manning, 2000b). The commons has become recognized as an important center of the school, especially for middle school students. These large areas provide an excellent location for students to gather and interact. It must support this type of activity with seating, lighting, color schemes, and space (Hawkins and Lilley, 1998). TMS received the highest score in this area. The commons design here has incorporated current trends in color, natural lighting, size, location, ease of movement, interconnectedness, and acoustics. The other campuses have much smaller, less current commons area design.

Corridors must be conveniently wide and should lead to a commons area or other areas where the student can find respite from the stresses of the classroom. Each of the campuses received a satisfactory or excellent score in this area.

Areas for students to interact must be appropriately decorated and finished. Seating, plantings, graphics, and lighting must all be considered to create an adequate space for students outside of class time. All of the campuses received satisfactory or excellent scores in this area.

Large group areas such as gymnasiums, auditoriums, libraries, commons, and cafeterias must be designed for visual supervision of students. Narrow hallways, alcoves, and visual barriers detract from this capability and may lead to student misbehavior. Some provisions for sound control should be present. Light switches and

speaker connectivity permit more convenient usage of these spaces. All of the campuses meet or exceed these requirements and received excellent and satisfactory scores.

Acoustical treatment of walls, ceilings, and floors adds to the effectiveness of the learning environment. Ceilings should have plaster or acoustical tile, walls should have sound reducing panels or curtains, and floors should be covered with carpet for sound absorption. The most important of these is the floor treatment with carpet. All of the campuses have these factors in place throughout their spaces. All of the campuses received excellent scores on this point.

Windows for natural lighting is the source of disagreement for building designers. Natural lighting is proven to enhance the learning environment and improve student academic achievement (Schneider, 2002). However, windows increase maintenance and utility costs. The potential for a quality educational environment is increased with some level of natural lighting provided (Hawkins and Lilley, 1998). All of the campuses have some level of natural lighting either in the classroom or non-classroom areas. Each of the campuses, therefore, received an excellent or satisfactory score.

A pleasing atmosphere is a critical component to a high quality learning environment. As mentioned earlier, the lines and shapes of furniture and equipment contribute to the overall quality of the learning environment. Even the orientation and grouping of furnishings can effect first impressions and psychological reactions from students, teachers and visitors. Therefore, furniture must meet age appropriate scale, color, and design (Hawkins and Lilley, 1998). CMS and AMS received borderline

scores in this area. The furnishings in these buildings are outdated in design and color. Much of the furniture is heavily worn and in need of repair. The remaining four campuses received excellent scores in this area.

Figure 91 depicts the collective scores on each section for each campus as reported by the survey team.

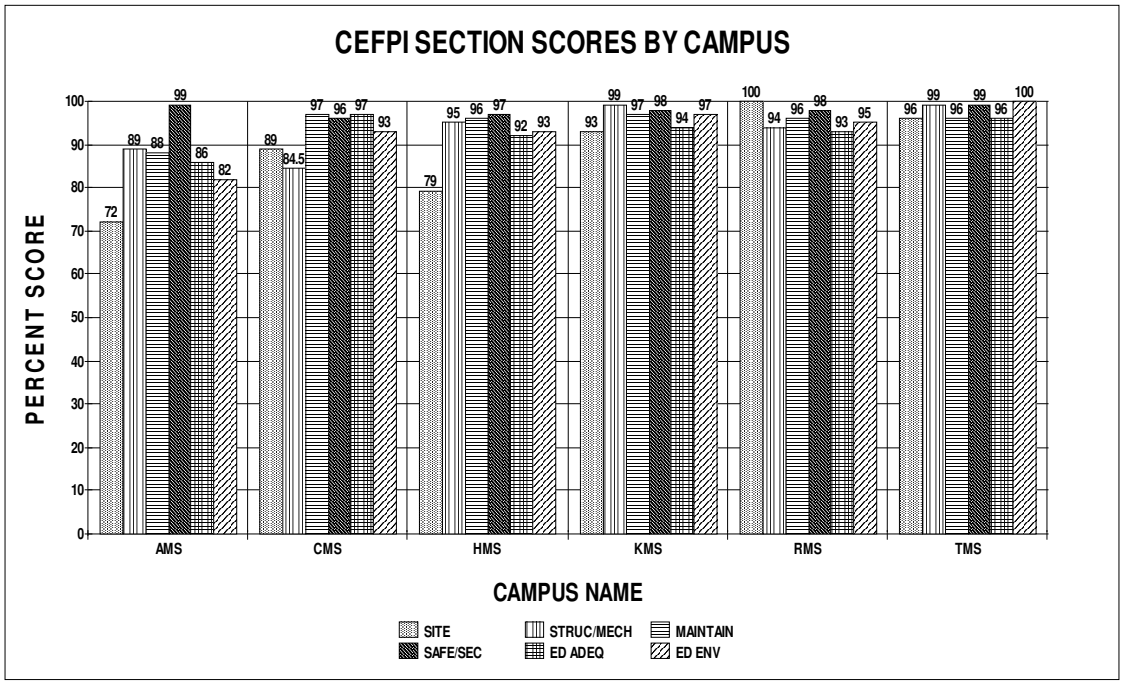

Figure 91: CEFPI section score comparison by campus.

This chart provides a visual reference of the quality and adequacy of each of the campuses in each evaluated area. While AMS is lacking in many of the areas, it, along with the other campuses does not fall below the satisfactory mark in any of the assessed areas. The score variation between highest and lowest scoring areas on all the campuses

is 13 points. Only two scored areas fall into the satisfactory range. AMS scored a 72% in the School Site category and HMS scored a 79%. All middle school facilities had a cumulative score between 85.6% and 97.9%. In other words, all middle school facilities in Humble ISD were either satisfactory or excellent in terms of educational adequacy and quality.

Table 12 depicts the campus cumulative scores out of 1,000, the percentage rating for each campus, and the district average. The average percentage score for the middle schools in Humble ISD is 93.5% . Hawkins and Lilley (1998) equate this excellent score with facilities that are educationally adequate and of high quality. As defined by Hawkins and Lilley, these facilities serve the educational needs of the community and the school district. The scores also indicate that the facilities are conducive to learning and provide an excellent environment for education.

Table 12: CEFPI campus cumulative scores and district average

Campus	Score (1000)	Percentage
AMS	856	85.6
CMS	925	92.5
HMS	928	92.8
KMS	965	96.5
RMS	955	95.5
TMS	979	97.9
AVERAGE	935	93.5

Research Question Three

Research question three states "What is the relationship between the perceived educational adequacy and quality of the HISD middle level facility's as reported by teachers and administrators on the TLEA and the perceived impact of these facilities on the learning environment as reported by teachers and administrators on the TLEA?" Research question three was answered using the Phi Coefficient. The Phi Coefficient measures the strength and type of the relationship between the perceived adequacy and quality of middle school facilities and the perceived impact that the facilities have on the learning environment. This test measures the degree of relationship between two binary variables. A value of exactly 0 indicates that there is no relationship, a value of 1 indicates a perfect positive relationship between variables, and a value of -1 indicates a perfect negative relationship between perceived adequacy and impact (Spatz, 2001). A perfect positive relationship indicates that a change in one variable is accompanied by equivalent changes in the same direction in the other variable. For example in this case, if respondents perceived that a factor was very adequate they would also record that the same factor had a high impact. A phi score of -1.0 describes a perfect negative relationship or one in which a change in one variable is accompanied by equivalent changes in the opposite direction to that variable (Issac and Micheal, 1995). For example, if respondents reported that a factor was very adequate, the negative relationship to this is the report that the same factor has no impact on the learning environment. Phi is used with nominal data using 2-by-2 tables and the measure is

similar to the Pearson Correlation Coefficient in interpretation. The difference in the two methods is that Phi adjusts the chi-square significance to factor out sample size.

In calculating the Phi Coefficient true dichotomous scores are required. This is achieved by coding educator responses to adequacy and impact either 1 or 2. The TLEA questions about the adequacy and quality of factors in facilities are stated such that an "agree" response indicates adequacy. Any level of "agree" response was coded as a 2. Any level of "disagree" responses was coded as a 1. Similarly, each factor has a "perceived impact on the learning environment" query. A significant or moderate impact response was coded as a 2. A minimal or no impact response was coded as a 1. While this process creates a true dichotomy from a set of four responses, it does have the effect of masking the complete picture that a 4-point likert scale can provide.

There were 236 respondents and each respondent answered two questions about a facility characteristic for a total of 164 responses per subject. This resulted in 38,704 responses each coded 1 or 2. Therefore, the data is nominal and creates a true dichotomy which warrants the use of the Phi Coefficient to measure relationship. A "high-high" (2,2) score on any factor indicates a perfect positive correlation or direct relationship between adequacy and quality and impact. A 2,2 score suggests that a facility factor is adequate and has an impact on the learning environment as perceived by respondent teachers and administrators. A "low-low" (1,1) score on any factor indicates a perfect positive correlation also. A 1,1 score on any factor suggests that the factor is not educationally adequate and has little or no effect on the learning environment. A "high-low" or "low-high" (2,1 or 1,2) score indicates a negative correlation exists. In

this case, a factor that is reported as adequate has no impact or a factor that is reported as not adequate has an impact on the learning environment (Huck, 2003). These scores were entered onto spreadsheets in the *Statistical Package for Social Studies* (SPSS version 11.5, 2003). The resulting Phi Coefficient scores for each of these questions are displayed through charts and matrices.

In analyzing the data, the respondents from each campus are disaggregated and organized by campus. AMS had 35 respondents for a total of 5,740 data points. CMS had 32 respondents for a total of 5,248 data points. HMS had 34 respondents for a total of 5,576 data points. KMS had 42 respondents for a total of 6,888 data points. RMS had 39 respondents for a total of 6,396 data points. TMS had 54 respondents for a total of 8,856 data points. Therefore the total number of responses for the Phi Coefficient analysis is 38,704. The interpretation of the Phi Coefficient is as follows (Simon, 2005):

- -1.0 to -0.7 strong negative relationship
- -.07 to -0.3 weak negative relationship
- -0.3 to +0.3 no relationship
- +0.3 to +0.7 weak positive relationship
- +0.7 to +1.0 strong positive relationship

Table 13 depicts each question from the TLEA survey and the Phi Coefficient for each question. The first twenty-six questions or 63% of the questions are from the Educational Adequacy section of the survey and the remaining 15 questions or 37% are from the Environment for Education section. All but one of the Phi scores fall into the range between -.03 and +.03. In other words, 99% of the Phi scored questions fall into this range. This range indicates that no relationship exists between perceived adequacy and quality and impact on the learning environment.

Table 13: TLEA questions with corresponding phi coefficient and relationship type

Question	Phi Coefficient	Relationship		Question	Phi Coefficient	Relationship
1	-0.136	none		42	-0.117	none
2	-0.108	none		43	-0.169	none
3	-0.211	none		44	0.101	none
4	0.005	none		45	0.144	none
5	-0.363	weak negative		46	0.208	none
6	-0.217	none		47	-0.010	none
7	-0.175	none		48	-0.001	none
8	-0.219	none		49	-0.140	none
9	-0.206	none		50	-0.112	none
10	-0.186	none		51	-0.178	none
11	-0.137	none		52	-0.078	none
12	-0.054	none		53	-0.088	none
13	-0.057	none		54	-0.067	none
14	0.009	none		55	0.068	none
15	-0.071	none		56	0.068	none
16	-0.166	none		57	-0.134	none
17	-0.196	none		58	-0.021	none
18	-0.285	none		59	-0.200	none
19	-0.022	none		60	-0.253	none
20	-0.193	none		61	-0.170	none
21	-0.244	none		62	-0.087	none
22	-0.242	none		63	-0.233	none
23	0.272	none		64	-0.194	none
24	-0.284	none		65	-0.256	none
25	-0.238	none		66	-0.236	none
26	-0.113	none		67	-0.196	none
27	-0.114	none		68	-0.229	none
28	-0.124	none		69	-0.129	none
29	-0.124	none		70	0.237	none
30	-0.031	none		71	-0.017	none
31	-0.156	none		72	-0.040	none
32	-0.134	none		73	-0.053	none
33	-0.137	none		74	-0.106	none
34	-0.222	none		75	-0.060	none
35	-0.121	none		76	-0.198	none
36	0.029	none		77	-0.033	none
37	-0.001	none		78	-0.009	none
38	-0.081	none		79	-0.047	none
39	-0.174	none		80	-0.080	none
40	-0.044	none		81	0.022	none
41	-0.112	none		82	0.017	none

Figure 92 graphically depicts the Phi scores for the TLEA survey questions. Phi Coefficient scores between +.30 and -.30 indicate that no relationship exists between the two perceived factors. Eleven percent of the questions fall between zero and .30. Eighty-eight percent of the questions fall between zero and -.30. Therefore, in ninety-nine percent of the factors, there is no relationship between perceived adequacy and quality and impact on the learning environment. Stated another way, teacher perception of adequacy and quality was not related to perception of impact on the learning environment. Through visual inspection of this table it is apparent that there is a narrow range of Phi scores for the 82 factors on the survey. The Standard Deviation for these scores is 0.118 with a Mean of -0.105. This suggests that respondents consistently responded the same way to the statements of adequacy and impact with little variance. When comparing the low standard deviation in Phi scores with the fact that in almost every case, no relationship exists between perceived adequacy and quality and impact, subjects separated the two characteristics of each factor or considered them not related to one another. Furthermore, it can be stated that subjects independently rated the adequacy and quality of a factor from the rating of perceived impact on the learning environment. This suggests alignment between how subjects independently rated adequacy and quality and perceived impact on the learning environment. One question (#5) has a weak negative relationship with a Phi Coefficient of -.363. Question five states: Storage for student materials is adequate. A weak negative relationship suggests that respondents perceived that this factor was inadequate and having an impact on the learning environment.

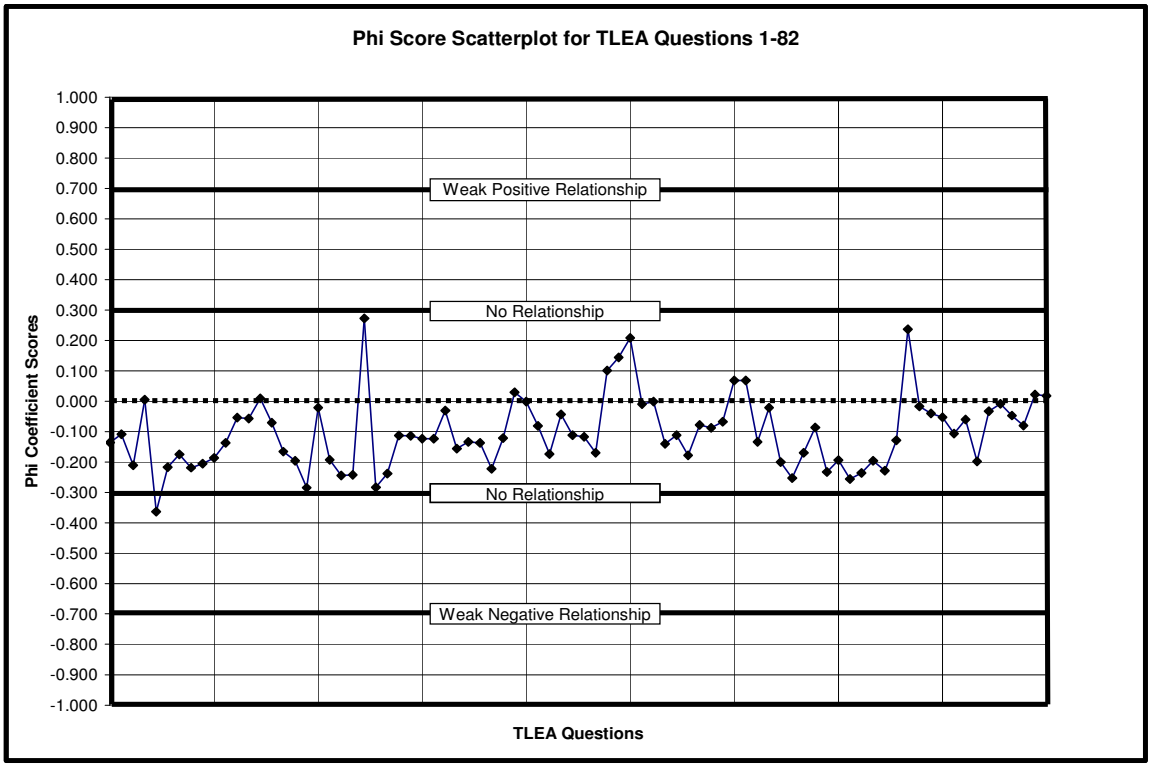

Figure 92: Phi score run chart for TLEA questions 1-82.

Research Question Four

Research question four states: Is there congruency between the perceived adequacy and quality of middle school facilities as reported on the TLEA survey for educators and the quality and adequacy as assessed by the CEFPI instrument for architects? Both instruments assess middle level facilities for educational adequacy and quality. The TLEA instrument was derived from the CEFPI instrument through the dissertation of Dr. David O'Neil with the assistance of Dr. Hawkins of Texas A&M University. Fifty questions about adequacy and quality are the same on both instruments and this congruency necessitates discussion. Because the CEFPI instrument is a numeric assessment of a facility's adequacy and quality and the TLEA instrument is a measure of

perception of adequacy, statistical analysis is not possible. Additionally, the CEFPI weights scores differently in each category and on each factor in each category. The additive scoring method utilizes a 6 level likert scale measurement of each item within a facility. The TLEA instrument uses a four point likert scale to measure perception of facility adequacy and the impact that each factor is perceived to have on the learning environment. Therefore, correlational statistical methods could not be designed to interpret such differing scoring, assessment, and coding disparity. However, non-conclusive observations can be made about facility scores related to educator perception.

Table 14 depicts the congruency between identical questions on the two instruments. Congruency is achieved between the identical questions if TLEA respondents perceived that a factor had adequacy and quality and the architect team assessed the factor as having adequacy and quality using the CEFPI instrument or if a factor is inadequate on both instruments.

Table 14: Fifty identical questions on the TLEA and CEFPI instruments and congruency

TLEA	CEFPI	Question Text	Congruent
1	5.1	Size of academic learning space meets state standards (700 sq. ft.).	Y
2	5.2	Classroom space permits arrangements for small group activity.	Y
3	5.3	Location of academic learning areas is near related educational activities and away from disruptive noises.	Y
4	5.4	Personal space in the classroom away from group instruction allows privacy time for individual students.	N
5	5.5	Storage for student materials is adequate.	N
6	5.6	Storage for teacher materials is adequate.	N
16	2.11	There are sufficient and well located electrical outlets available in the instructional areas of the building.	Y
17	5.7	Size of specialized learning areas meet state standards.	Y

Table 14: Continued

TLEA	CEFPI	Question Text	Congruent
18	5.8	Design of specialized learning areas is compatible with instructional needs of students.	Y
19	5.9	Library/Resource/Media center provides appropriate space, occupies a space of a minimum of 2,100 sq. ft., and acts as an instructional lab.	Y
20	5.1	Gymnasium facilities adequately serve physical education instruction.	Y
21	1.8	Outdoor facilities adequately serve physical education instruction.	Y
22	5.12	Music programs are provided adequate sound-treated space.	Y
23	5.13	Space for art is appropriate for instruction and supplies/equipment is adequate.	Y
24	5.11	Science program is provided sufficient space and equipment with science lecture-lab rooms a minimum of 1,000 sq. ft.	Y
27	5.14	Room design for technology education maximizes the use of state-of-the-art equipment.	Y
28	5.15	Space for small groups and remedial instruction is provided adjacent to the classrooms.	N
32	5.17	Teachers' lounge and work areas support teachers as professionals.	Y
33	5.18	Cafeteria/kitchen is attractive with sufficient space for seating/dining, delivery, storage, and food preparation.	Y
34	5.19	Administrative offices are consistent in appearance and function with the maturity of students served.	Y
35	5.2	Counselor's office ensures privacy and sufficient storage.	Y
36	5.21	Clinic is near or can communicate with administrative offices and is equipped to meet requirements.	Y
37	5.23	Administrative personnel are provided sufficient work space and privacy.	Y
41	1.1	Teacher parking is convenient and sufficient to accommodate building staff and campus visitors.	Y
42	5.22	Suitable reception space is available for students, teachers, and visitors so they feel welcome.	Y
48	6.1	Overall design is aesthetically pleasing and appropriate for the age of the students.	Y
49	6.3	Exterior noise and surrounding environment do not disrupt learning.	Y
50	6.4	Entrances and walkways are sheltered from sun and inclement weather.	Y
51	6.5	Building materials provide attractive color and texture.	Y
53	6.2	Site and building are well landscaped.	Y
54	2.4	Exterior walls, or windows and trim were painted less than 5 years ago and are in excellent condition.	Y
55	1.3	Location of facility enhances the learning climate of the school.	Y

Table 14: Continued

TLEA	CEFPI	Question Text	Congruent
56	6.6	Color schemes, building materials, and décor provide an impetus to learning.	Y
57	6.7	Year around comfortable temperature and humidity are provided throughout the building.	N
58	6.1	The floor plan of the building helps direct student movement and minimizes student disruptions.	Y
59	6.8	Ventilating system provides adequate quiet circulation of clean air and meets Indoor Air Quality standard requirements.	Y
60	6.9	Lighting systems provide proper intensity, diffusion, and distribution of illumination.	Y
61	6.1	Sufficient drinking fountains and restroom facilities are conveniently located per building codes.	Y
62	6.11	Communication among students is enhanced by common areas.	Y
63	6.12	Appropriate foyers and corridors aid traffic flow.	Y
64	6.13	Areas for students to interact are suitable to the age group.	Y
65	6.14	Large group areas are designed for effective management of students.	Y
66	6.15	Acoustical treatment of ceilings, walls and floors provide effective sound control.	Y
67	6.16	The majority of classrooms have windows.	N
69	6.2	Classroom furniture is functionally sound and facially attractive.	Y
70	6.15	With the exception of the gym, music, shop, and home economics, classrooms are carpeted.	Y
73	6.1	The condition of your facility is excellent both cosmetically and structurally.	Y
74	6.11	There are a variety of places, both inside and outside of the school, where students can meet together in both small and large groups.	Y
77	2.2	There are no visible indications of roof leaks in the school facility.	Y
78	2.4	Interior walls, including classroom spaces, were painted less than 8 years ago or are in excellent condition.	Y

The two sections on each instrument that have congruent questions are the Environment for Education and Educational Adequacy. Hawkins and O'Neill created this congruency because the educational adequacy of school buildings is the purpose of the entire appraisal process. "This is true because schools exist primarily to serve the educational

needs of a community and school district." (Hawkins and Lilley, 1998, p. 28). There are fifty areas where congruency existed and four areas where the architect team assessment of facility adequacy and quality differed from teacher perception of facility adequacy and quality. This equates to a 92% congruency between what the architect team assessed and what the teachers perceived as educationally adequate. The first area of disagreement is in the area of student storage space, statement 5. The architect team found this to be adequate and educators in the facility perceived it to be inadequate. The second area of disagreement concerns small group instruction areas in proximity to classrooms, statement 28. Educators perceived that these areas are not adequate and the architect team found that they met state standards. The third area of non-congruence concerns year-round comfortable temperature and humidity in the facilities, statement 57. Educators in these facilities perceived strongly that temperature and humidity levels are not comfortable and the assessment team found them to be within required ranges. The fourth area of disagreement concerns the number of windows in classrooms statement 67. The assessment team determined that the number of windows in classrooms is adequate while educators disagreed strongly in their perception that they were not adequate. These four areas equate to an 8% disagreement between what respondents perceived as adequacy and quality and what the architect team assessed as adequate. In the remaining 92% of these areas both respondents and the assessment team agreed that the factor in question was adequate and of high quality.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was four-fold. First, this study determined the quality and educational adequacy of Humble ISD middle level educational facilities and their impact on the learning environment as reported by middle school teachers and administrators on the TLEA survey instrument. Second, this study measured the quality and educational adequacy of middle level educational facilities in the Humble Independent School District as assessed by an architect team using the Council of Educational Facility Planner's Int'l (CEFPI) Guide for School Facility Appraisal Instrument for Middle School Appraisal (Hawkins and Lilley, 1998). Third, this study determined the relationship between the perceived quality and adequacy of the HISD middle level facility and the perceived impact that these facilities have on the learning environment as reported by educators in those facilities. Finally, this study presented the congruency between the perceived adequacy and quality of middle school facilities as reported on the TLEA survey for educators and the quality and adequacy as assessed by the CEFPI instrument for architects.

While there has been extensive research on the characteristics of the middle level child, information is limited on the educational facilities needed to meet the needs of the middle school child (O'Neill, 1999). These points are clear within this context:

1. Educational facilities have an impact on the learning environment for children. This has been understood since the early days of educational facility planning in the United States.

2. Middle level children between the ages of 10 and 15 have very distinct developmental characteristics that mandate high quality, adequate, and responsive educational facilities.

3. There is a gap in the literature between what is known about high school children's' characteristics and facility needs and elementary children and their facility needs. Information is needed on what specifically makes an adequate, high quality educational facility at the middle school level (O'Neill, 1999).

The following summary of findings, conclusions, and recommendations will meet the four-fold purpose of the research and close the gap in literature concerning the educational adequacy and quality of middle school facilities and the impact that they have on the learning environment.

Research Question One

Findings

Research question one was designed to determine the educational quality and adequacy of middle school facilities in Humble ISD and the impact that these facilities have on the learning environment as reported by teachers and administrators (educators) on the Texas Learning Environment Assessment survey. Educational facility adequacy is the extent to which the school meets the educational needs of a community and a school district (Hawkins and Lilley, 1998).

Educational Facility Quality is the level to which the school supports the learning environment and educational programming. The impact that a facility has on the learning environment is the level of influence that the physical aspects of a school have

on the learning process. In assessing the educational adequacy and quality of the middle school facilities, all TLEA questions are phrased such that any "agree" response indicates that the factor of that facility meets the educational need of the community and school district and that it supports the learning environment and educational programming. Any level of disagreement to the statements indicates that the factor does not meet the educational needs of the community and school district and does not support the learning environment and educational programming. Eighty-nine percent of the 19,352 responses to the questions of educational adequacy and quality of these facilities were answered either agree or strongly agree. Eleven percent of the responses were answered either disagree or strongly disagree. There are nine areas in the middle school facilities that respondents perceived as inadequate. Seven areas were part of the Educational Adequacy section of the survey and two were part of the Environment for Education section. The nine areas perceived to be inadequate and lacking quality are as follows:

- Personal space in the classroom away from group instruction which allowed for privacy time for students was perceived as not adequate.
- Storage space for student materials was perceived as inadequate.
- Storage space for teacher materials was also perceived as not adequate.
- Large flexible workstation space to accommodate student projects was reported to be not available and inadequate.
- Space for small groups and remedial instruction next to classrooms were reported to be not existent and inadequate.

- Individual teacher office space away from the classroom was perceived as not adequate.
- Teacher professional libraries were perceived as not available and not adequate.
- Respondents perceived that year around comfortable temperature and humidity was not provided and not adequate.
- Respondents perceived that natural lighting through the use of classroom windows was not provided and inadequate.

Respondents perceived these to have a significant or moderate impact on the learning environment.

Six of the nine areas, or 67%, that respondents reported to be inadequate have a common theme. The common language in these questions focuses on the issue of adequate and quality space.

- The common inadequate factors are: personal space for students, storage space for students, storage space for teachers, workstation space for students, small group space, and teacher office space.
- These areas are inadequate because they do not meet the educational needs of the school district and the community and they do not support the learning environment or the educational programming of the school.
- Additionally, these factors are perceived to have a significant or moderate impact on the learning environment.

The remaining three areas that respondents perceived as inadequate were varied and without a common theme.

- Respondents perceived that their professional libraries were inadequate.
- They perceived that comfortable temperatures did not existent throughout the year.
- Their classrooms had an inadequate number of windows.

In assessing the perceived impact of the facility on the learning environment, respondents answered significant and moderate impact or minimal and no impact. Of the 19,352 responses to this question, 91% indicated that respondents perceived that the factors had a significant or moderate impact on the learning environment. Nine percent of the responses indicated that the factor in question had little or no impact on the learning environment. Five of these responses were part of the Educational Adequacy section of the survey and two were part of the Environment for Education section of the survey. The seven areas perceived as having no impact on the learning environment are as follows:

- It was perceived that the appearance of administrative offices had little or no impact on the learning environment.
- The proximity of clinics to administrative offices and ability to meet requirements in the facilities was perceived to have little or no impact on the learning environment.
- The availability of work space and privacy for administrative personnel had little or no impact on the learning environment.
- Faculty, staff and visitor parking proximity and availability had little or no impact on the learning environment.

- Suitable reception space had little or no impact on the learning environment.
- Meeting rooms for parents and volunteers had little or no impact on the learning environment.
- The landscaping of the school site and around the building had little or no impact on the learning environment.

Each of these areas was reported to be educationally adequate by the respondents.

Conclusions

The purpose of research question one was to determine the educational quality and adequacy of middle school facilities and the impact that they have on the learning environment as reported by teachers and administrators using the TLEA instrument. The researcher sent out 512 TLEA surveys to middle school educators in Humble ISD. Respondents returned 236 completed surveys. Respondents perceived their facilities to have educational adequacy and quality in 89% of the areas evaluated. Respondents perceived that 91% of the evaluated areas had some level of impact on the learning environment. Insufficient space was cited in six of nine areas considered inadequate. Two of the remaining three inadequate areas are the ambient factors of comfortable temperatures and natural lighting. The final inadequate area is the professional library. Each of these areas was perceived to have an impact on the learning environment as well. By contrast, he architect team found storage space for teachers and students, personal space, and small group space to be adequate from a purely quantitative perspective. The architect team also found the ambient qualities of comfortable temperatures and natural lighting to be within standards. However, in each of these

inadequate areas, the person using the space daily with students knows first-hand if they meet the needs of the school and the community and supports the learning environment and educational programming. Therefore, some corrective action must be taken to improve these shortcomings.

The seven areas that respondents perceived as having no impact on the learning environment concerned administrative offices, the clinic, parking, reception space, meeting rooms, and landscaping. The respondents perceived these areas to be adequate as did the architect team. The primary customers who provide the service of learning to students through direct contact very astutely separate these spaces into a different level than that which directly impacts the learning environment. Each of these physical areas, while possibly affecting teacher and administrator morale, student health, student discipline, and public perception, has very little influence on student learning. However, while not impacting the learning environment, these areas are critical to the functioning of every school. Respondents logically observe that administrative areas, clinics, parking, reception space, meeting rooms, and landscaping have little to with learning and the learning environment. The more important observations are the areas that respondents perceive to have an impact on the learning environment. It is these factors in a facility that impact student learning. Factors that respondents perceive to have an impact on the learning environment must be maintained to the level that they continue to be educationally adequate with quality.

Recommendations for the District and Further Research

Recommendations for the District

In the area of educational quality and adequacy, middle school educators identified nine areas that are not currently meeting the needs of the schools and not supporting the educational programming. The subjects responding to this survey are the primary customers in these facilities and use them daily to support the education of middle school children. Humble ISD construction managers, architects, administrators, governing bodies should consider measures to re-evaluate these areas that educators consider educationally inadequate and lacking quality and allocate funds to replace, improve, or create them.

Part of this research question had respondents identify the level of impact that these factors had on the learning environment. They had a level type-choice of no impact, minimal impact, moderate impact or significant impact. In the response to the question of the facility impact on the learning environment, middle school educators identified seven areas that have little impact on the learning environment. Eighty-five percent of the facility factors identified in this survey are perceived to impact the environment for learning at the middle school level in Humble ISD. These 75 remaining areas that educators perceive to have an impact must be maintained at an adequate and high quality level. The district maintenance office should, if it has not already, create a monthly maintenance checklist to insure the educational adequacy and quality for these 75 factors and others does not negatively impact the learning environment.

Further Research

A further study should be conducted on the question of impact where the type of impact is explored. For example, the question could be re-stated to ask if a factor had varying levels of negative or positive impact. This could be coupled with a question of level of maintenance of an area and the type of effect that poorly maintained factors have on the learning environment. In this manner, differing degrees of maintenance attention could be given to areas that have a negative impact if they are neglected. An additional area of further research should be a consideration of the impact that size has on the learning environment.

Research Question Two

Findings

Research question two was designed to determine the educational adequacy and quality of middle school facilities as assessed by a disinterested architect and administrator using the CEFPI assessment instrument. The CEFPI instrument was designed to measure the quality and educational adequacy of school facilities through the appraisal of six areas: The School Site, Structural and Mechanical Features, Plant Maintainability, School Building Safety and Security, Educational Adequacy, and Environment for Education. The difference between the application of the CEFPI instrument and the application of the TLEA instrument is the user and the emotional connection to the facility. While the teachers and administrators at each of their respective buildings perceive shortcomings in adequacy and quality and a large impact

in 85% of the factors in question, an unbiased architect and administrator with a purely quantitative instrument should assess the facilities from a metric point of view.

Each of the six middle schools in Humble ISD have identical energy sources, air conditioning/heating systems, type of construction, exterior surfacing, floor construction, and roofing. Each of the middle schools has very similar settings, enrollment, capacity, number of floors, and square footage. Student demographics, while in the perspective of many in the district is widely varied, is similar on each of the campuses. Each of the campuses, except for TMS has a very similar footprint and extracurricular field support. Each of the campuses is operated by identically designed administrative teams with similar sized faculty and staff. All of the campuses have had recent upgrades and renovations within the past seven years. In sum, the six middle school campuses in Humble ISD are very similar which was the goal at the time of their construction. This similarity in many areas lends itself to similar assessment scores within a narrow range.

While AMS is deficient in many of the areas evaluated, it, along with the other campuses does not fall below the satisfactory mark in any of the assessed areas. The score variation between highest and lowest scoring areas on all the campuses is 13 points. Only two scored areas fall into the satisfactory range. AMS scored a 72% in the School Site category and HMS scored a 79%. All middle school facilities had a cumulative score between 85.6% and 97.9%. In other words, all middle school facilities in Humble ISD were either satisfactory or excellent in terms of educational adequacy and quality. The average percentage score for the middle schools in Humble ISD is 93.5% . Hawkins and Lilley (1998) equate this excellent score with facilities that are

educationally adequate and of high quality. As defined by Hawkins and Lilley, these facilities serve the educational needs of the community and the school district. The scores also indicate that the facilities are conducive to learning and provide an excellent environment for education.

Humble ISD middle school facilities exhibit educational adequacy and quality. These facilities meet the needs of the school district and the community and support the educational programming provided for students. Each of the school sites is either satisfactory or excellent. Campus physical safety and security on the six campuses is satisfactory or excellent. Structurally and mechanically the buildings are sound, providing an envelope that is supportive of learning. Due to the durable and high quality construction materials in each of the buildings, the maintainability of the campuses is also satisfactory and excellent. Academic learning spaces, specialized learning spaces, and support spaces on all of the campuses are conducive to learning thus achieving a satisfactory or excellent score. The exterior and interior environments for education are equally superior and received satisfactory to excellent scores. As a notation, Atascocita Middle School was deficient during the time of this survey. Many of these deficiencies were due to ongoing renovations in and around the campus. This renovation has been completed and many of the exterior envelope deficiencies have been corrected.

Conclusions

The purpose of this research question was to determine the educational quality and adequacy of middle school facilities in Humble ISD as assessed by an evaluation team using the CEFPI instrument. Middle schools in Humble ISD achieved an overall

score of 93.5 from this assessment. From the table of weights and categories in the CEFPI instrument, Middle Schools in Humble are Excellent in terms of educational quality and adequacy. As is expected of any facility, with increasing age comes increasing deficiencies. This is only partially true for the Humble ISD middle schools. KMS is the oldest school in the district but with recent campus renovations it scored as well as the newest schools. AMS and CMS, the next two oldest schools which have not had complete renovations, scored an 85.6 and 92.5 on the assessment instrument. As stated above, renovations at AMS at the time of the assessment have been completed which, from a surficial walk-thru by the researcher, has improved on many of the external deficiencies. An estimated current score for AMS would likely place it in the 90 range.

The excellent quality and adequacy at each of these campuses is a testament to the diligent and consistent preventive maintenance processes on these campuses. This also reflects the expectations of the customer base in the communities supported by these facilities. Furthermore, the accepted norms of continuous communication between campus administrators and maintenance repair teams are evident in the quality and adequacy of each campus. The process for observing maintenance needs, reporting them, and addressing them is working in Humble ISD.

Recommendations for the District and Further Research

Recommendations for the District

As indicated by the data, the School Site at AMS and HMS requires increased maintenance and improvement efforts. At AMS, the location factor was deficient. This

is a situation that will not improve with time because of the large influx of subdivision construction and businesses in the area. Landscaping on this campus should be improved which would add quality to the location deficiency. Outdoor education areas are deficient and need to be added at AMS. Parking is deficient at this campus and can be improved with additional space added on surplus acreage. HMS has a deficiency in the size of the site. It is not sufficient to meet future educational needs as defined by state and local requirements. There is acreage adjacent to this site which offers an option for improvement. The landscaping at HMS is in need of improvement and should be considered to improve the overall school site. Suitable outdoor learning areas are limited at this site and should be considered for improvement. It is important to note that while the assessment team appraised the landscaping on these campuses as deficient, respondents from the TLEA found them to be adequate and more importantly having little impact on the learning environment.

Humble ISD utilizes a "maintenance-on-demand" process where twice monthly, a maintenance technician is assigned to each campus for one day. This is an effective process which is born out in the data. The district should continue this process and it is recommended that it be increased over time as each of the campuses increases in age. The communication process whereby campus administrators may call in and prioritize maintenance problems on their campuses is again proven to be effective through the data. This process should be continued and encouraged to be used.

Further Research

Further research should be conducted to align the CEFPI and TLEA instruments either into one instrument that could be used by educators and architects or two separate instruments with identical scoring processes. Currently, any comparison of the two instruments is un-wielding for several reasons. The two instruments have only 50 common questions currently which leave gaps in the data between what the customer perceives as adequacy and quality, and what the provider/architect perceives as adequacy and quality in a facility. If the two instruments assessed identical factors, a more complete picture of adequacy and quality in a facility could be created. The two instruments have very different scoring processes. The CEFPI uses a 6-level dynamic numeric scale of assessment for each factor. The TLEA instrument uses a simple 4-level likert scale of agreement with a statement about the facility. If both instruments were aligned in their scoring techniques, a very valuable, viable, reliable, and valid comparison could be made between what the customer perceives in their facility and what the builder perceives as adequacy and quality.

Research Question Three

Findings

Research question three was designed to determine the relationship between the perceived educational adequacy and quality of a facility as reported by teachers and administrators on the TLEA and the perceived impact of these facilities on the learning environment as reported by teachers and administrators on the TLEA. Research question three is answered using the Phi Coefficient. The Phi Coefficient measures the

type and strength of relationship between these two variables. Phi is used with nominal data on 2-by-2 tables. Adequacy was coded as a 2 and inadequacy a 1. Impact on the learning environment was coded a 2 and no impact a 1. A "high-high" (2,2) score on any factor indicates a perfect positive correlation or direct relationship between adequacy and quality and impact. A 2,2 score suggests that a facility factor is adequate and has an impact on the learning environment as perceived by respondent teachers and administrators. A "low-low" (1,1) score on any factor indicates a perfect positive correlation also. A 1,1 score on any factor suggests that the factor is not educationally adequate and has little or no effect on the learning environment. A "high-low" or "low-high" (2,1 or 1,2) score indicates a negative relationship where adequacy has no impact or no adequacy has an impact on the learning environment. Only one question resulted in a weak negative association between perceived adequacy and impact. Ninety-nine percent of the responses resulted in Phi Coefficients in the range that indicates no relationship between perceived adequacy of a facility factor and its perceived impact on the learning environment. This suggests that respondents consistently responded the same way to the statements of adequacy and impact with little variance. In other words, subjects were aligned in how they rated quality and adequacy and how they perceived impact on the learning environment. When comparing the low standard deviation in Phi scores with the fact that in almost every case, no relationship exists between perceived adequacy and quality and impact, subjects separated the two characteristics of each factor or considered them not related to one another. Subjects were able to compartmentalize or independently rate one variable from another. Furthermore, it can

be stated that respondent perception of adequacy and quality of a factor is not related to their perception of impact on the learning environment.

Conclusions

The purpose of this research question is to determine the relationship between perceived adequacy and quality and perceived impact of facilities at the middle school level. Phi coefficients for 81 of the 82 assessed factors indicate that there is no relationship between perceived adequacy and quality and impact on the learning environment. This suggests that respondents evaluated a facility factor based on the level of adequacy and quality and did not associate this level with the impact that it had on the environment. Rather than perceiving that adequacy and quality had an effect on the impact that a factor had, respondents evaluated the adequacy and quality of a factor separately from the evaluation of impact on the learning environment. Subjects were able to compartmentalize or independently rate one variable from another variable. There is little association between how a respondent rated adequacy and quality and how they perceived impact on the learning environment. This is a logical result because regardless of the adequacy and quality of a factor such as room size, the factor will have an impact on the learning environment. Furthermore, non-relationship provides an unbiased assessment of the true adequacy an quality of a factor and the impact that a factor may have on the learning environment. Finally, in the areas where respondents perceived no impact, they perceived each of them to be adequate. This further suggests that respondents were able to separate the assessment of quality and adequacy from the assessment of impact on the learning environment. Conversely, areas that were

perceived to be inadequate were perceived to have an impact on the learning environment.

Further Research

Further research should be conducted in order to determine the factors that caused respondents to assess the quality and adequacy of a factor separate from its impact on the learning environment. Stated another way, why did respondents not perceive a factor's adequacy and quality as causing an impact on the learning environment? What environment existed in this setting to cause or allow subjects to separate the two evaluative parameters? Was this ability for subjects to respond in this manner unique to this setting or not unique? Are the factors that existed in this setting transferable? Examples of these factors may be campus satisfaction, educator facility knowledge base, facility effectiveness, and facility importance. From these factors, effective facility design could incorporate what the primary user perceives as important in a specific factor. For example, respondents identified areas such as administrative areas that were adequate yet had no impact on the learning environment. These areas may require less funding or square footage in order to redirect benefits to more educationally beneficial areas. Furthermore, respondents identified facility factors that were inadequate yet had an impact on the learning environment. From the Phi data, they did this without relating adequacy to impact. Inadequate ambient factors such as temperature and natural lighting could be enhanced to a level where they were no longer perceived to impact the learning environment.

Research Question Four

Findings

Research question four was designed to identify any congruence between the results from the TLEA survey and the CEFPI Appraisal instrument. Fifty questions about adequacy and quality are the same on both instruments and this congruency necessitates discussion. Congruency is achieved between the identical questions if TLEA respondents perceived that a factor had adequacy and quality and the architect team assessed the factor as having adequacy and quality using the CEFPI instrument or if a factor is inadequate on both instruments. There was incongruence on 6 of the fifty mutually identical questions. Educators and architects reported the remaining 44 factors as adequate. None of the congruent responses indicated inadequacy. There was 88% congruence between perceived adequacy and quality and assessed adequacy and quality. The evaluation team and respondent educators disagreed on the adequacy of student storage space, student privacy space, teacher storage space, small group instruction areas, comfortable temperatures, and classroom windows. In each of these six cases, respondents perceived these factors as inadequate and the evaluation team assessed them as adequate.

Conclusions

The purpose of this research question was to determine if any level of congruence existed between teacher and educator perceived educational adequacy and quality in their facilities as reported on the TLEA and the assessed educational adequacy and quality of the same facilities as reported by an evaluation team using the CEFPI

appraisal instrument. Because the CEFPI instrument is a numeric assessment of a facility's adequacy and quality and the TLEA instrument is a measure of perception of facility adequacy and quality, statistical analysis is not possible. Additionally, the CEFPI weights scores differently in each category and on each factor in each category. The additive scoring method utilizes a 6 level likert scale measurement of each item within a facility. The TLEA instrument uses a four point likert scale to measure perception of facility adequacy and the impact that each factor is perceived to have on the learning environment. Therefore, correlational statistical methods could not be designed to interpret such differing scoring, assessment, and coding disparity.

However, a large percentage of congruency exists in the 50 mutually identical questions on both instruments. Respondents and the evaluation team agreed on 44 of the 50 questions on the educational adequacy and quality of middle school facilities in Humble ISD. This suggests that at a very basic level, the two groups observe adequacy and quality of facilities from a similar perspective. This also suggests that there is validity in the two group's assessment of what is adequate and high quality in these middle school facilities. Furthermore, these results indicate that the instruments measure what they were designed to measure. This level of agreement also indicates that, indeed, these areas meet the needs of the school and the community and that they support the educational programming for middle school students in these facilities. This level of agreement between the two groups in this study is perhaps the most important indicator of the educational adequacy and quality that these facilities exhibit. Two-hundred and thirty six teachers and administrators and a team of administrators reached the same

conclusion on the adequacy and quality of facilities using different instruments, different measurement parameters, at different times, and with different expertise and training levels.

Further Research

The level of agreement between the two groups indicates that a powerful evaluation technique exists at least in this area and perhaps many other areas of study. Further research should be conducted in this manner to determine if agreement at this level was an isolated occurrence. Additionally, this technique, while not planned initially, and considering the strength of the relationship, should be investigated and considered as an evaluation tool in the future.

The level of agreement in these fifty areas suggests that further agreement could occur in other areas as well. An enhanced TLEA type instrument with the full battery of 82 questions that match the 82 CEFPI assessment areas should be developed and utilized to add validity to the facility evaluation process at every grade level. In this manner, architects and construction managers would have quantitative measures of adequacy and quality and the perceived quality and adequacy of the primary users of those facilities.

Research should be conducted to update the 1998 CEFPI instrument so that it is current with 2007 building advancements. Examples of these improvements are as follows:

- Question 2.7 refers to friable asbestos. Since the inception of AHERA requirements, friable asbestos is almost non-existent and very difficult to detect without instrumentation.

- Question 2.9 refers to light sources overheating. Current lighting cylinders are low heat devises which removes this concern.
- Question 4.5 refers to intramural equipment. This type of equipment is rare and replaced by physical education department equipment and thus should be worded as such.
- Question 4.6 refers to heating units. Modern campuses utilize central heating and air and this should be updated.
- Questions 3.2 and 4.12 about flooring are duplicitous and should be combined into one question.
- Question 4.14 refers to wire-infused glass. The use of this type of glass is no longer common.
- Questions 4.11 and 4.20 about alarm systems are repetitive and should be combined.
- Question 5.9 refers to the Library/media center. Schools are moving away from media centers as electronic supply centers because of common TVs, DVDs, and internet connections.
- Questions 5.5, 5.6, and 5.16 all refer to teacher and student storage space and should be collapsed into one question.
- Question 6.2 and 1.4 refer to quality of landscaping and should be collapsed into one question.
- Question 6.8 refers to ventilating systems. The current common term is “air handling systems”.

- Question 6.10 and question 2.13 both refer to quality and number of drinking fountains and should be collapsed into one question.
- Current building trends include conduit for internet and wireless computer connect ability. This is not mentioned as a quality or adequacy factor.
- Current building trends regularly include conduit for security camera attachment and upgrades. This is not mentioned as a quality or adequacy factor.

Closing

Considering the strength of the congruence between the two groups as to the adequacy and quality of these facilities, the results of the TLEA survey, and the results of the CEFPI Appraisal instrument, it is clear that the middle school facilities in Humble ISD as they exist presently, meet the needs of the school, the school district, and the community, and support the educational programming and learning environment. This conclusion is attained through four research methods. Two-hundred thirty six (46%) teachers and administrators in the six middle schools in Humble ISD completed a survey of their perception the quality and adequacy of their facilities. The respondents also reported their perception of the impact that these facilities have on the learning environment in their facilities. An evaluation team of an unbiased architect and administrator assessed the quality and adequacy of the same facilities using a quantitative instrument for the appraisal of middle school facilities. A relationship evaluation was conducted to determine if a relationship existed between educator perception of adequacy and quality and perception of the impact that these facilities had

on the learning environment. The level of agreement between educator perception of adequacy and quality and architect assessment of adequacy and quality was determined.

Through each of these techniques a common result has surfaced. From the TLEA survey, 89% of responses indicate that the middle school facilities in Humble ISD meet the needs of the school, the district and the community and that they support the educational programming and learning environment. From the TLEA survey, 91% of the responses indicate that the facilities have an impact on the learning environment. From the CEFPI Appraisal, the middle school facilities in Humble ISD scored 93.5% which indicates that they are excellent facilities. They are very adequate and of high quality. In an investigation on the relationship between perceived adequacy and quality and perceived impact, 50% of the response relationships were found to be significant or due to factors other than chance. This indicates that respondents consciously made a connection between adequacy and quality and the impact that a facility has on the learning environment. Finally, on fifty mutually identical responses about facility adequacy and quality, 92% of the respondents agreed on the adequacy and quality of those facilities.

This evidence indicates that middle school facilities in Humble ISD are excellent in quality and adequacy. The factors in these facilities that create adequacy and quality for middle school children and support an environment conducive to learning can and should be used as models for future middle school facility construction. These model facilities can impact thoughtful planning, constructing and renovating of children's learning environments. Humble ISD is facing massive growth in student numbers with a

soft tax base and academically demanding constituents. The recent demographic study by the Kris Seigert (2004) concluded that Humble will grow from 27,000 students to 39,500 students by 2013. This demographic study concluded that Humble ISD will need 9 elementary schools, 3 middle schools, and 1 new high school in that time frame. With research that indicates a positive relationship between facility design and the learning environment, Humble ISD must build new facilities and renovate the old so that they enhance rather than detract from the learning environment. The results of this research can positively impact the future of middle school facility design in Humble ISD and will close the gap in research on supportive facilities for the middle aged adolescent.

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APPENDIX A

THE TOTAL LEARNING ENVIRONMENT ASSESSMENT (TLEA) MIDDLE SCHOOL VERSION

Total Learning Environment Assessment (TLEA) Middle School Version

Survey Instrument

Directions: The following are statements about your school. Please indicate the extent to which each statement characterizes your school facility by marking the appropriate response. To ensure that your data is submitted properly, please use **Internet Explorer** as your browser.

Submit Reset

School Code: (county-district-campus number)

1. **What is the age of your facility?**
   Click arrow to view choices
2. **If the school has been renovated, how long ago was the most recent renovation done?**
   Click arrow to view choices
3. **At the time the building was built or renovated, to what extent was school instructional personnel involved in the planning process with building designers?**
   Click arrow to view choices
4. **To what degree is the instructional philosophy of your campus integrated into the learning environment?**
   Click arrow to view choices
5. **Are portable buildings utilized as classrooms on your campus?**
   Click arrow to view choices

Educational Adequacy

Academic Learning Space

1. Size of academic learning (classroom) space meets state standards (700 sq.ft.)

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

2. Classroom space permits arrangements for small group activity.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

3. Location of academic learning areas is near related educational activities and away from disruptive noises.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

4. Personal space in the classroom away from group instruction allows privacy time for individual students.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

5. **Storage for student materials is adequate.**

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

6. **Storage for teacher materials is adequate**

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

7. **Classrooms can be arranged to enhance the teaching/learning objectives.**

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

8. The school facility is adaptable to users needs.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

9. The school facility accommodates a variety of learning styles of students.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

10. Large flexible space and/or workstations are available to accommodate student projects.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

11. Computers in classrooms and computer labs have functional furniture designed for their use.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

12. Classrooms have telephones for communicating both within and outside the facility.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

13. Classrooms have logical, well designed, integrated technology systems.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

14. School has technology plan that includes development of environment for interdisciplinary teaming.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

15. Classrooms have computers that are networked for both intranet and internet utilization.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

16. There are sufficient and well located electrical outlets available in the instructional areas of the building

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Specialized Learning Space

17. Size of specialized learning areas meet state standards. (e.g. computer classrooms are a minimum of 900 sq. ft.)

Strongly Disagree	Disagree	Agree	Strongly Agree

1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

18. Design of specialized learning areas are compatible with instructional needs of students.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

19. Library/Resource/Media Center provides appropriate space, occupies a space of a minimum of 2,100 sq. ft., and acts as an instructional lab.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

20. Gymnasium facilities adequately serve physical education instruction.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

21. Outdoor facilities adequately serve physical education instruction.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

22. Music programs are provided adequate sound-treated space.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

23. Space for art is appropriate for instruction and supplies/equipment are adequate.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

24. Science program is provided sufficient space and equipment with science lecture-lab rooms a minimum of 1,000 sq. ft.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

25. Science lab equipment has been updated less than five years ago to meet current standards.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

26. Utilities such as gas, water and electricity are available and are in usable condition in science labs.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

27. Room design for technology education maximizes the use of state-of-the-art equipment.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

28. Space for small groups and remedial instruction is provided adjacent to the classrooms.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

29. Academic team/department members occupy specific areas together within the school building or are organized by pods.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

30. The media center is well equipped with computers.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

31. There are conference areas available for things such as team/department meetings, parent conferences, or faculty planning sessions.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Support Space

32. Teachers' lounge and work areas support teachers as professionals.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

33. Cafeteria/kitchen is attractive with sufficient space for seating/dining, delivery, storage, and food preparation.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

34. Administrative offices are consistent in appearance and function with the maturity of students served.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

35. Counselor's office insures privacy and sufficient storage.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

36. Clinic is near or can communicate with administrative offices and is equipped to meet requirements.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

37. Administrative personnel are provided sufficient work space and privacy.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

38. Teachers have their own office space (apart from their classroom) with access to telephones and computers.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

39. School facility has a teacher professional library that is accessible as well as current.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

40. The school facility permits teachers to function as professionals.

Strongly Disagree	Disagree	Agree	Strongly Agree

1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

41. Teacher parking is convenient and sufficient to accommodate building staff and campus visitors.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Community/Parent Space

42. Suitable reception space is available for students, teachers, and visitors so they feel welcome.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

43. The school building has meeting rooms for parents, and/or offices for volunteers and volunteer coordinators.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

44. The school facility is an integral part of the community in that it is utilized after school, evenings or weekends.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

45. The school building design incorporates community functions as a part of the normal operation of the school.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

46. Common space, classrooms, gymnasiums, cafeterias, library, media centers, computer labs and performing arts centers are available and used by the community for non-educational purposes.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

47. Utilization of facility reflects community values.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Environment for Education

Exterior Environment

48. Overall design is aesthetically pleasing and appropriate for the age of the students.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

49. Exterior noise and surrounding environment do not disrupt learning.

Strongly Disagree	Disagree	Agree	Strongly Agree

1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

50. Entrances and walkways are sheltered from sun and inclement weather.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

51. Building materials provide attractive color and texture.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

52. Proper maintenance (exterior) of the school facility is a priority and vandalism and/or graffiti are repaired/removed quickly.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

53. Site and building are well landscaped.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

54. Exterior walls, or windows and trim were painted less than 5 years ago or are in excellent condition.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

55. Location of facility enhances the learning climate of the school.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Interior Environment

56. Color schemes, building materials, and décor provide an impetus to learning.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

57. Year round comfortable temperature and humidity are provided throughout the building.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

58. The floor plan of the building helps direct student movement and minimizes student disruptions.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

59. Ventilating system provides adequate quiet circulation of clean air and meets Indoor Air Quality (IAQ) standard requirements.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

60. Lighting systems provide proper intensity, diffusion, and distribution of illumination.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

61. Sufficient drinking fountains and restroom facilities are conveniently located per building codes.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

62. Communication among students is enhanced by common areas.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

63. Appropriate foyers and corridors aid traffic flow.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

64. Areas for students to interact are suitable to the age group.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

65. Large group areas are designed for effective management of students.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

66. Acoustical treatment of ceilings, walls, and floors provide effective sound control.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

67. The majority of classrooms have windows.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

68. Classroom furniture and equipment is moveable and can be arranged in different ways facilitating group projects and various activities or in accordance with the prescribed instructional methodology.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

69. Classroom furniture is functionally sound and facially attractive.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

70. With the exception of gym, music, shop, home economics, and art, classrooms are carpeted.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

71. Proper maintenance (interior) of school facility is a priority and vandalism or graffiti are repaired/removed quickly.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

72. Custodial daily routines are effective in keeping facility clean and attractive.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

73. The condition of your facility is excellent both cosmetically and structurally.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

74. There are a variety of places, both inside and outside of the school, where students can meet together in both small and large groups.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

75. The school facility fosters communication.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

76. The school facility creates an appropriate behavioral setting.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

77. There are no visible indications of roof leaks in the school facility.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

78. Interior walls, including classroom spaces, were painted less than 8 years ago or are in excellent condition.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Visual Reinforcement

79. There are numerous displays or student work inside each classroom and on many corridor walls.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

80. Classroom rules and consequences are posted in each room.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

81. Student and class accomplishments are highlighted in the classroom and throughout the building.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
☐	☐	☐	☐

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

82. There are posters, mobils or displays relating to topics being studied.

Strongly Disagree	Disagree	Agree	Strongly Agree

1	2	3	4
○	○	○	○

Perceived impact on the learning environment:

significant impact moderate impact minimal impact no impact

Submit

Thank you for your participation. Have a great day!

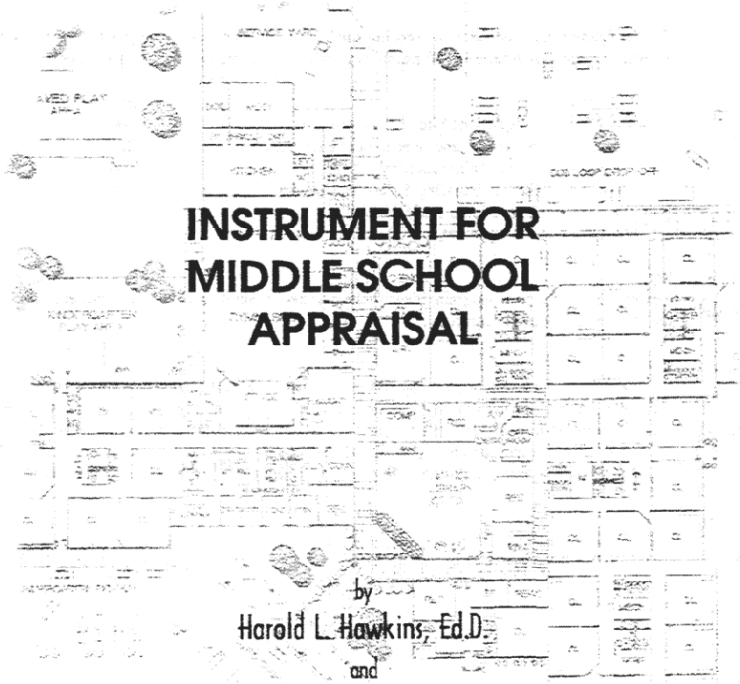
APPENDIX B

THE COUNCIL FOR FACILITIES PLANNING INTERNATIONAL (CEFPI) INSTRUMENT FOR MIDDLE SCHOOL APPRAISAL

CEFPI
Guide for School Facility Appraisal

Guide for School Facility Appraisal

1998 Edition



INSTRUMENT FOR MIDDLE SCHOOL APPRAISAL

by
Harold L. Hawkins, Ed.D.
and
H. Edward Lilley, Ph.D.

Directions for Appraising Facilities

Middle School Appraisal

Prior to evaluating a building, the appraiser should become familiar with the educational program provided within the existing school facility. It is essential also to determine other pertinent factors about the facility which will provide background information sufficient to insure a thorough and accurate appraisal. Particularly helpful are the building's architectural plans, specifications and layout, if these are available. If possible, the school plant should be appraised at a time when school is in session so that the actual use of the building is more apparent.

Although the Appraisal Guide is designed for individual appraiser use, ideally the school facility should be evaluated at the same time by three to five appraisers. The ratings by each of the appraisers should then be used to arrive at a consensus for each item. The final rating is the result of careful review of the individual scores.

The instrument uses an additive scoring method, with each item having a maximum number of allowable points. A total of 1000 points is distributed among these six major categories:

Section		Maximum Points
1.0	The School Site	100
2.0	Structural and Mechanical Features	200
3.0	Plant Maintainability	100
4.0	School Building Safety and Security	200
5.0	Educational Adequacy	200
6.0	Environment for Education	200

Prior to Appraisal

Step I

Review the educational program; identify the number of faculty members and students; and examine the floor and plot plans carefully.

Overview of the Building and Grounds

Step II

Upon approach to the site look for traffic patterns, school safety signs, neighborhood environment, etc. Begin the appraisal by taking a preliminary tour of the entire building noting both exterior and interior features. Information obtained prior to arrival at the campus recorded in the Building Data Record should be verified. The appraisal weights should not be determined during this initial walk through. The appraisal is better accomplished as separate individual steps in the process.

Assignment of Scores

Step III

After the completion of the preliminary inspection, go through the entire instrument section by section. The appraisal will be more accurate if each item is carefully considered while it is appropriately observed. **Do not try to evaluate from memory** — use actual observation when making the appraisal decision.

Items that are needed/required but are non-existent should be given a 0 score. If an item is not needed and is non-existent full credit should be allowed.

Note the Table of Weights for assistance in determining the score to be given each item. Each item should first be considered in the following terms: Non-Existent, Very Inadequate, Poor, Borderline, Satisfactory, and Excellent. The weight (score) should then be assigned for that item.

Place score in space provided in the Points Allotted Column, total the score for each Section and insert in the space provided. The Section totals should then be tabulated and indicated in the Points Assigned column of the Appraisal Summary. Use the space provided in the Justification for Allocation of Points to provide notes justifying the scores at the extreme ends of the scale (e.g. very inadequate, or excellent.)

CEFPI
Guide for School Facility Appraisal

Building Data Record

Name of Appraiser _____ Date of Appraisal _____

Building Name _____

Street Address _____

City/Town, State, Zip Code _____

Telephone Number(s) _____

School District _____

Setting: ❑ Urban ❑ Suburban ❑ Small City ❑ Rural

Site-Acreage _____ Building Square Footage _____

Grades Housed _____ Student Capacity _____

Number of Teaching Stations _____ Number of Floors _____

Student Enrollment _____ As Of _____

Dates of Construction _____

Energy Sources: ❑ Fuel Oil ❑ Gas ❑ Electric ❑ Solar

Air Conditioning: ❑ Roof Top ❑ Window Units ❑ Central ❑ Room Units

Heating: ❑ Central ❑ Roof Top ❑ Room Units
❑ Forced Air ❑ Steam ❑ Hot Water

Type of Construction: ❑ Load Bearing Masonry ❑ Steel Frame ❑ Concrete Frame ❑ Wood
❑ Other _____

Exterior Surfacing: ❑ Brick ❑ Stucco ❑ Metal ❑ Wood
❑ Other _____

Floor Construction: ❑ Wood Joists ❑ Steel Joists ❑ Slab on Grade ❑ Structural Slab
❑ Other _____

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Guide for School Facility Appraisal

Appraisal Guide for School Facilities

Table of Weights and Categories

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10
15	0	3	6	9	12	15
20	0	4	8	12	16	20
25	0	5	10	15	20	25

Appraisal Summary

SECTION	POSSIBLE POINTS	TOTAL EARNED	PERCENT	RATING BY CATEGORY
1.0 The School Site	100			
2.0 Structural and Mechanical	200			
3.0 Plant Maintainability	100			
4.0 School Building Safety & Security	200			
5.0 Educational Adequacy	200			
6.0 Environment for Education	200			
TOTAL	1,000			

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Guide for School Facility Appraisal

1.0 The School Site

100 Points

1.1	**Site is large enough** to meet present and future educational needs as defined by state and local requirements.	25	
1.2	**Site is easily accessible** and conveniently located for the present and future population.	20	
1.3	**Location** is removed from undesirable business, industry, traffic, and natural hazards.	10	
1.4	Site is **well landscaped and developed** to meet educational needs.	10	
1.5	Well equipped **athletic and intramural areas are separated** from streets and parking areas.	10	
1.6	**Topography** is varied enough to provide desirable appearance and without steep inclines.	5	
1.7	Site has stable, well drained **soil free of erosion.**	5	
1.8	Site is suitable for **special instructional needs**, e.g. outdoor learning.	5	
1.9	**Pedestrian services** include adequate sidewalks with designated cross-walks, curb cuts, and correct slopes.	5	
1.10	Sufficient **on-site, solid surface parking** is provided for faculty, staff and community.	5	
	TOTAL — THE SCHOOL SITE	100	

Table of Weights and Categories

Minimum Basic Method	Sub-Standard	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10
20	0	4	8	12	16	20
25	0	5	10	15	20	25

2.0 Structural and Mechanical Features

200 Points

STRUCTURAL

2.1 Structure meets all **barrier-free** requirements both externally and internally. 15

2.2 **Roofs** appear sound, have positive drainage, and are weather tight. 15

2.3 **Foundations** are strong and stable with no observable cracks. 10

2.4 **Exterior and interior walls** have sufficient expansion joints and are free of deterioration. 10

2.5 **Entrances and exits** are located so as to permit efficient student traffic flow. 10

2.6 **Building "envelope"** generally provides for energy conservation. (See criteria) 10

2.7 Structure is **free of friable asbestos** and **toxic materials**. 10

2.8 Interior walls permit sufficient **flexibility** for a variety of class sizes. 10

Table of Weights and Categories

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
10	0	2	4	6	8	10
15	0	3	6	9	12	15

MECHANICAL/ELECTRICAL

2.9	**Adequate light sources** are well maintained, properly placed and are not subject to overheating.	5	
2.10	**Internal water supply** is adequate with sufficient pressure to meet health and safety requirements.	5	
2.11	Each teaching/learning area has adequate convenient **wall outlets**, phone and computer cabling for **technology applications.**	5	
2.12	**Electrical controls** are safely protected with **disconnect switches** easily accessible.	10	
2.13	**Drinking fountains** are adequate in number and placement, and are properly maintained including provisions for the disabled.	10	
2.14	Number and size of **restrooms meet requirements**.	10	
2.15	**Drainage systems** are properly maintained and meet requirements.	10	
2.16	**Fire alarms, smoke detectors, and sprinkler systems** are properly maintained and meet requirements.	10	
2.17	**Intercommunication system** consists of a central unit that allows dependable **two-way communication** between the office and instructional areas.	10	
2.18	**Exterior water supply** is sufficient and available for normal usage.	5	
	TOTAL — STRUCTURAL AND MECHANICAL FEATURES	200	

Table of Weights and Categories

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10
15	0	3	6	9	12	15

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3.0 Plant Maintainability

100 Points

3.1	**Exterior windows, doors, and walls** are of material and finish requiring minimum maintenance.	15	
3.2	**Floor surfaces** throughout the building require minimum care.	15	
3.3	**Ceilings and walls** throughout the building, including service areas, are easily cleaned and resistant to stain.	10	
3.4	**Built-in equipment** is designed and constructed for ease of maintenance.	10	
3.5	**Finishes and hardware,** with a compatible keying system, are of durable quality.	10	
3.6	**Restroom fixtures** are wall mounted and of quality finish.	10	
3.7	Adequate **custodial storage space** with water and drain is accessible throughout the building.	10	
3.8	Adequate **electrical outlets and power,** to permit routine cleaning, are available in every area.	10	
3.9	**Outdoor light fixtures, electric outlets,** equipment, and other fixtures are accessible for repair and replacement.	10	
	TOTAL — PLANT MAINTAINABILITY	100	

Table of Weights and Categories

Minimum Basic Skilled	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
10	0	2	4	6	8	10
15	0	3	6	9	12	15

CEFPI
Guide for School Facility Appraisal

4.0 Building Safety and Security

200 Points

SITE SAFETY

4.1 **Student loading areas** are segregated from other vehicular traffic and pedestrian walkways. 15

4.2 **Walkways,** both on and offsite, are available for safety of pedestrians. 10

4.3 **Access streets** have sufficient signals and signs to permit safe entrance to and exit from school area. 5

4.4 **Vehicular entrances and exits** permit safe traffic flow. 5

4.5 Locations and types of **intramural equipment** are free from hazard. 5

BUILDING SAFETY

4.6 The **heating unit(s)** is located away from student occupied areas. 20

4.7 Multi-story buildings have at least **two stairways** for student egress. 15

4.8 **Exterior doors** open outward and are equipped with panic hardware. 10

4.9 **Emergency lighting** is provided throughout the building with exit signs on separate electrical circuits. 10

4.10 **Classroom doors** are recessed and open outward. 10

4.11 **Building security systems** are provided to assure uninterrupted operation of the educational program. 10

Table of Weights and Ratings

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10
15	0	3	6	9	12	15
20	0	4	8	12	16	20

4.12	**Flooring** (including ramps and stairways) is maintained in a nonslip condition.	5	
4.13	**Stairs** (interior and exterior) meet standards (maximum 7"rise to 11" tread) and steps range in number from 3 - 16.	5	
4.14	**Glass** is properly located and protected with wire or safety material to prevent accidental student injury.	5	
4.15	**Fixed projections** in the traffic areas do not extend more than eight inches from the corridor wall.	5	
4.16	**Traffic areas** terminate at an exit or a stairway leading to an egress.	5	

EMERGENCY SAFETY

4.17	Adequate **fire safety equipment** is properly located.	5	
4.18	There are at least **two independent exits** from any point in the building.	5	
4.19	**Fire-resistant materials** are used throughout the structure.	5	
4.20	Automatic and manual **emergency alarm system** with a distinctive sound and flashing light is provided.	5	

TOTAL — BUILDING SAFETY AND SECURIY 200

Table of Weights and Categories

Maximum Points Allotted	Not Included	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
15	0	3	6	9	12	15

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Guide for School Facility Appraisal

5.0 Educational Adequacy

200 Points

ACADEMIC LEARNING SPACE

5.1 **Size of academic learning areas** meets desirable standards. 15

5.2 **Classroom space** permits arrangements for small group activity. 10

5.3 **Location of academic learning areas** is near related educational activities and away from disruptive noises. 10

5.4 **Personal space** in the classroom away from group instruction allows privacy time for individual students. 5

5.5 **Storage for student materials** is adequate. 5

5.6 **Storage for teacher materials** is adequate. 5

SPECIALIZED LEARNING SPACE

5.7 **Size of specialized learning area(s)** meets standards. 15

5.8 **Design of specialized learning area(s)** is compatible with instructional need. 10

5.9 **Library/Resource/Media Center** provides appropriate and attractive space. 15

5.10 **Gymnasium and outdoor facilities** adequately serve physical education instruction. 10

5.11 **Science** program is provided sufficent space and equipment. 10

5.12 **Music Program** is provided adequate sound-treated space. 10

Table of Weights and Categories

Maximum Points Allotted	Non-Existent	Very Inadequate 1-25%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10
15	0	3	6	9	12	15
25	0	5	10	15	20	25

5.13	**Space for art** is appropriate for instruction, supplies, and equipment.	10	
5.14	**Space for technology education** permits use of state-of-the-art equipment.	10	
5.15	Space for **small groups and remedial instruction** is provided adjacent to classrooms.	5	
5.16	**Storage for student and teacher material** is adequate.	5	

SUPPORT SPACE

5.17	**Teachers' lounge and work areas** support teachers as professionals.	10	
5.18	**Cafeteria/Kitchen** is attractive with sufficient space for seating/dining, delivery, storage, and food preparation.	10	
5.19	**Administrative offices** are consistent in appearance and function with the maturity of the students served.	10	
5.20	**Counselor's office** insures privacy and sufficient storage.	5	
5.21	**Clinic** is near administrative offices and is equipped to meet requirements.	5	
5.22	**Suitable reception space** is available for students, teachers, and visitors.	5	
5.23	**Administrative personnel** are provided sufficient work space and privacy.	5	
	TOTAL — EDUCATIONAL ADEQUACY	200	

Table of Weights and Categories

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10

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Guide for School Facility Appraisal

6.0 Environment for Education

200 Points

EXTERIOR ENVIRONMENT

6.1 Overall **design is aesthetically pleasing** and appropriate for the age of students. 15

6.2 Site and building are **well landscaped.** 10

6.3 **Exterior noise and surrounding environment** do not disrupt learning. 10

6.4 **Entrances and walkways are sheltered** from sun and inclement weather. 10

6.5 **Building materials** provide attractive color and texture. 5

INTERIOR ENVIRONMENT

6.6 **Color schemes, building materials, and decor** provide an impetus to learning. 20

6.7 **Year around comfortable temperature and humidity** are provided throughout the building. 15

6.8 **Ventilating system** provides adequate quiet circulation of clean air and meets 15cfm VBC requirement. 15

6.9 **Lighting system** provides proper intensity, diffusion, and distribution of illumination. 15

6.10 **Sufficient drinking fountains and restroom facilities** are conveniently located. 15

_6.11 **Communication among students** is enhanced by commons area. 10

Table of Weights and Interpretation

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Moderate 50-69%	Satisfactory 70-89%	Excellent 90-100%
5	0	1	2	3	4	5
10	0	2	4	6	8	10
15	0	3	6	9	12	15
20	0	4	8	12	16	20

6.12	**Traffic flow** is aided by appropriate foyers and corridors.	10	
6.13	**Areas for students to interact** are suitable to the age group.	10	
6.14	**Large group areas** are designed for effective management of students.	10	
6.15	**Acoustical treatment** of ceilings, walls, and floors provides effective sound control.	10	
6.16	**Window design** contributes to a pleasant environment.	10	
6.17	**Furniture and equipment** provide a pleasing atmosphere.	10	
	TOTAL — ENVIRONMENT FOR EDUCATION	200	

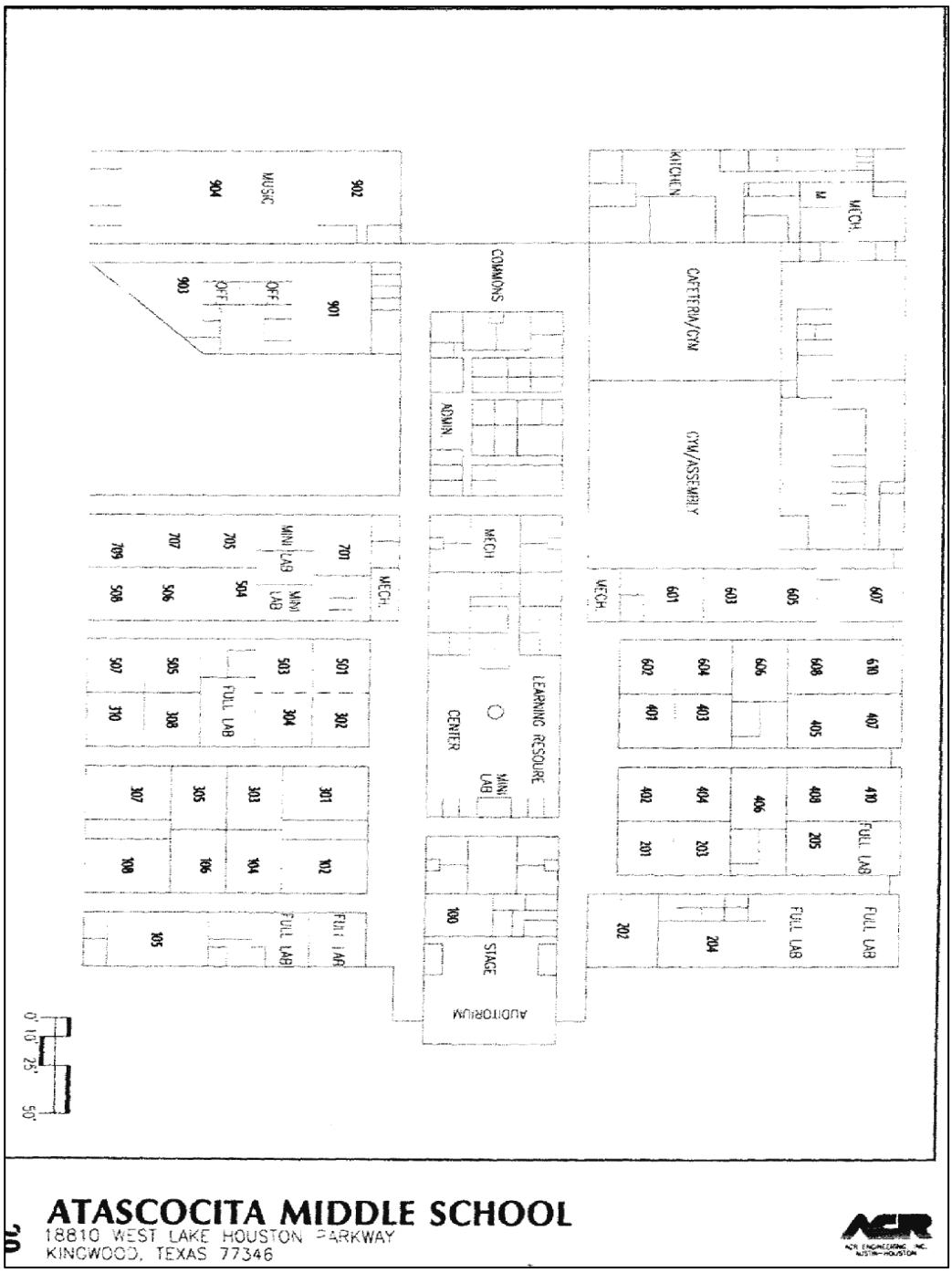
Table of Weights and Categories

Maximum Points Allotted	Non-Existent	Very Inadequate 1-29%	Poor 30-49%	Borderline 50-69%	Satisfactory 70-89%	Excellent 90-100%
10	0	2	4	6	8	10

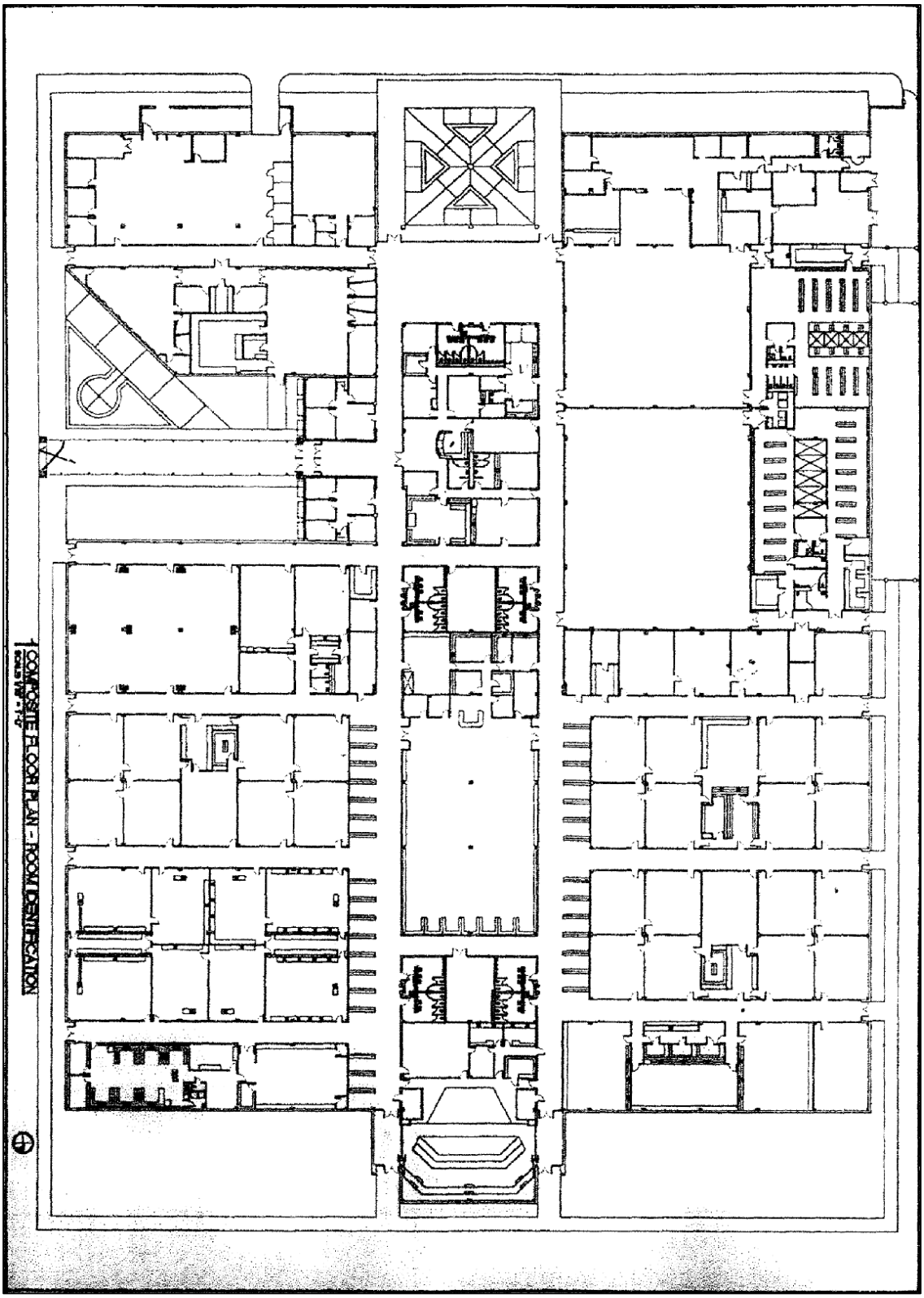
APPENDIX C

HUMBLE ISD MIDDLE SCHOOL CAMPUS FLOOR PLANS

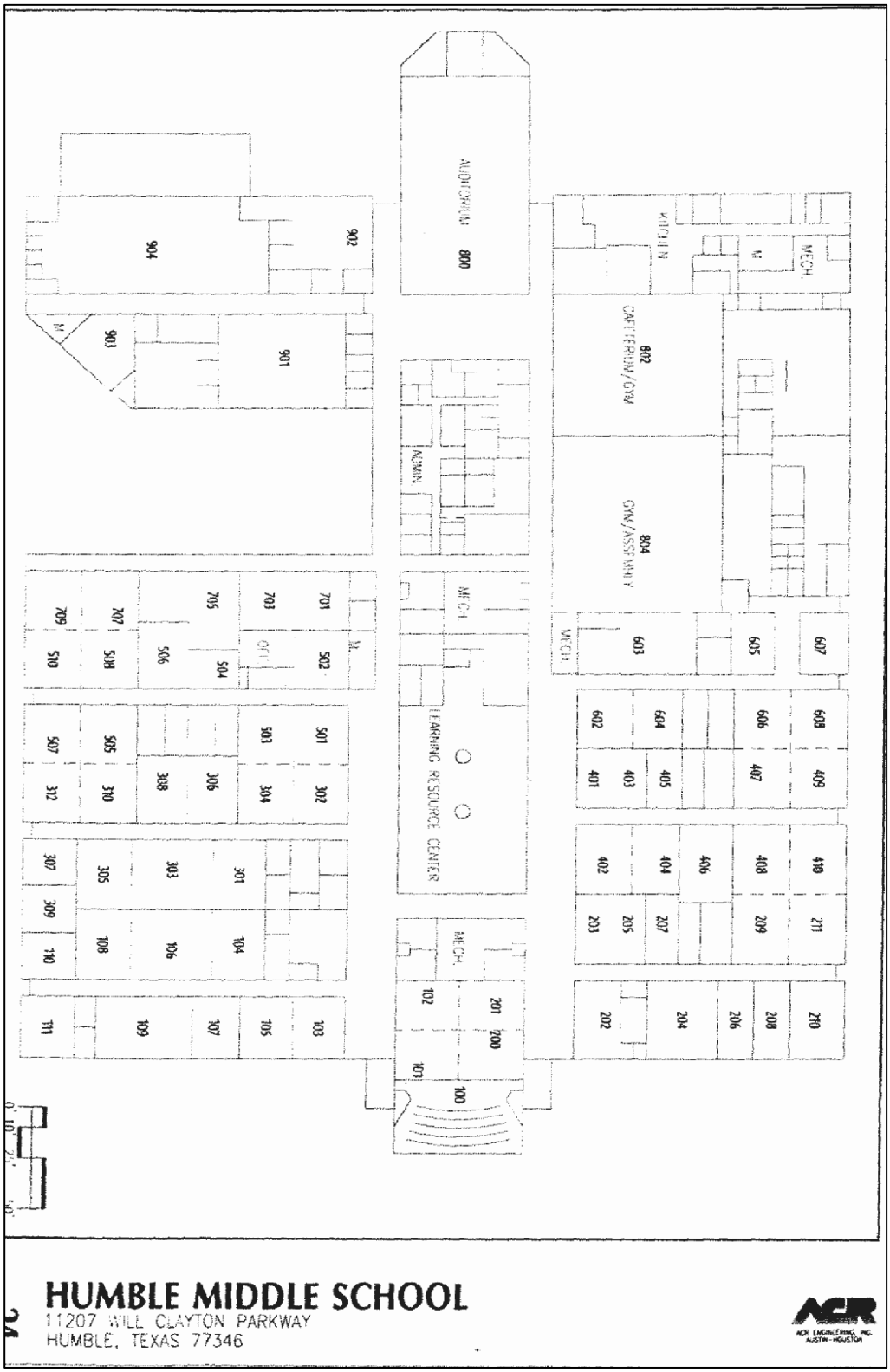
AMS Floor Plan



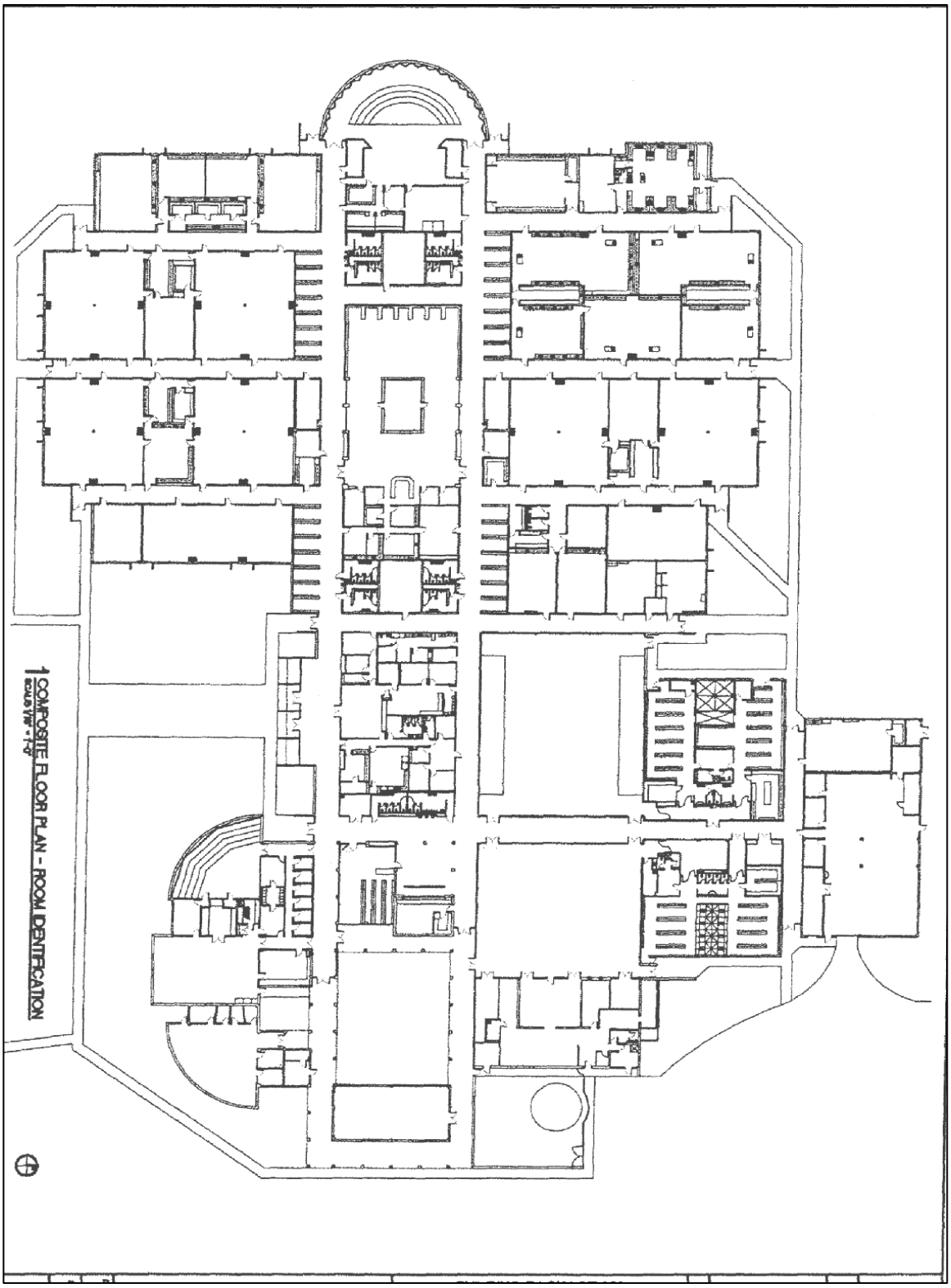
CMS Floor Plan



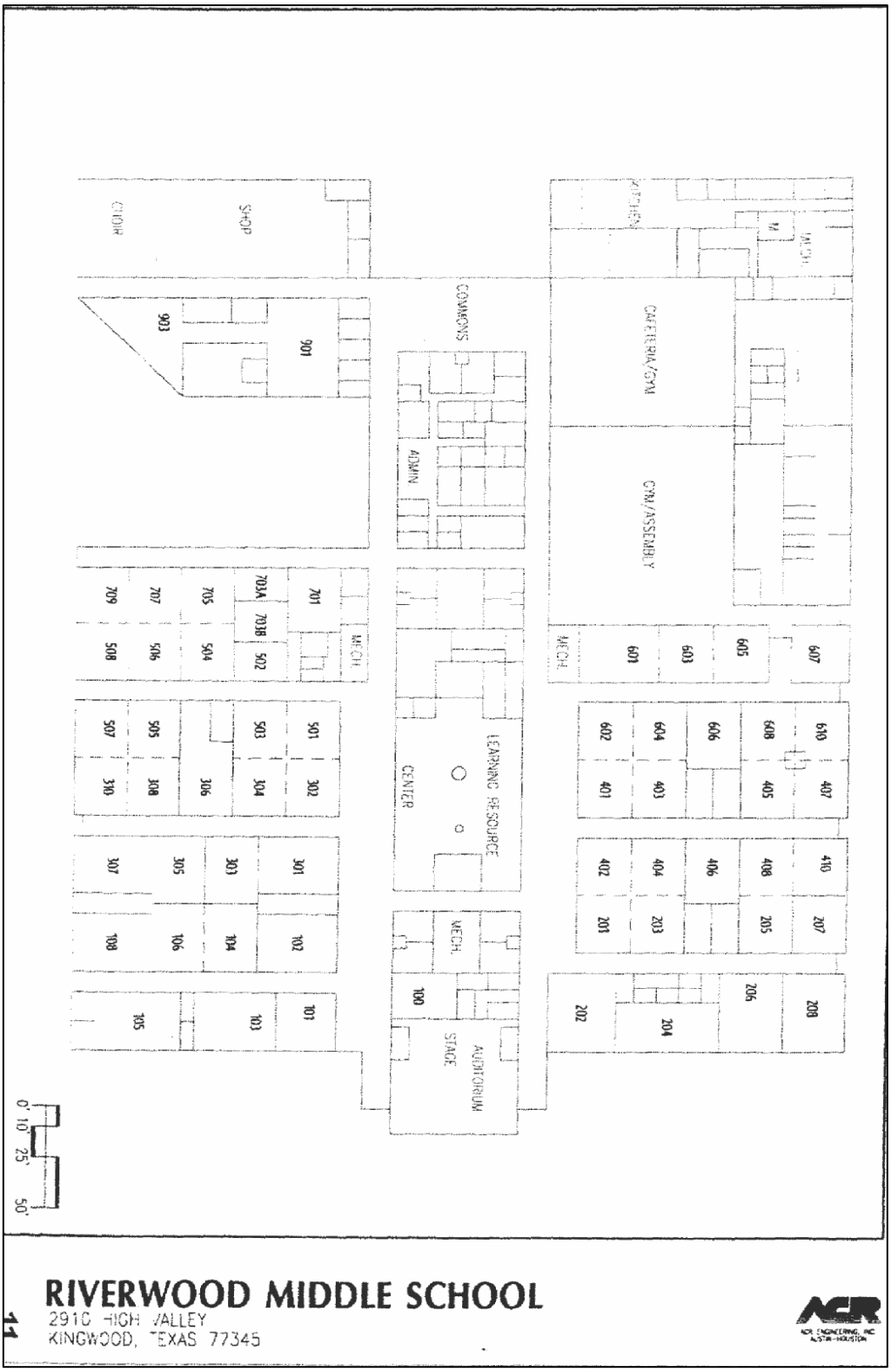
HMS Floor Plan



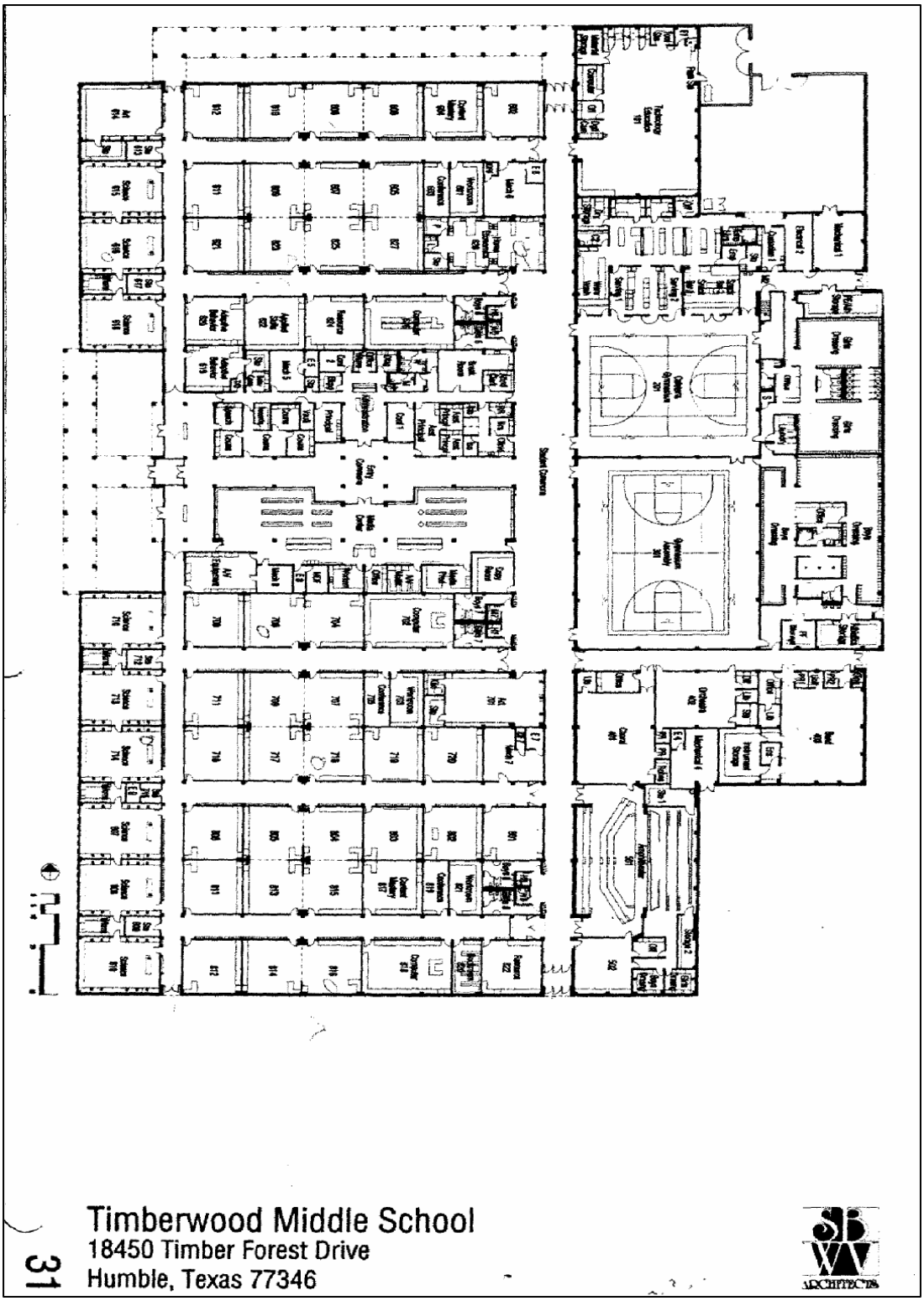
KMS Floor Plan



RMS Floor Plan



TMS Floor Plan



VITA

Douglas Matthew Monk
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EDUCATION

Ed.D., Education Administration, Texas A&M University, College Station, Tx.
M.Ed., Education Administration, The University of Texas at Brownsville and Texas Southmost College, Brownsville, Tx.
B.S., Geology, Stephen F. Austin State University, Nacogdoches, Tx.

EXPERIENCE

Humble Independent School District, Humble, Texas
Middle School Assistant Principal,
Middle School Associate Principal, High School Assistant
Principal, Safety Director January 1996-Present
As Assistant/Associate Principal, managed school operations, built learner centered instruction and relationships, and created safe, orderly, and secure campuses for optimized learning environments. As Safety Director managed district crisis response resources and personnel, organized campus emergency response and planning, and controlled personnel accidents and safety.

Marine Military Academy, Harlingen, Texas
Assistant Principal, Biology Teacher June 1992-January 1996
Managed school operations, school budget, personnel and human resources, salary allocation, and curricular organization. Created and supervised campus culture, community relations, campus systems, and academic policy and procedures.

United States Army
Engineer Officer December 1986-June 1992
Responsible for the safety, training, deployment to combat zones, and management of required logistics for platoon, company, and battalion sized units. Served as executive officer and aide-de-camp to the brigade commander in a combat and in garrison. Served as an engineer instructor at the Army engineer school.

Nacogdoches Independent School District, Nacogdoches, Texas
Earth Science Teacher June 1985-November 1986
Taught and managed 130 middle school students in a rural, small-town setting.

Austin Independent School District, Austin, Texas
Earth Science Teacher August 1984-May 1985
Taught and managed 130 middle school students in an inner-city school setting.