CHAPTER II

REVIEW OF RELATED LITERATURE

2.1. INTRODUCTION

This chapter presents a summary of the literature in the field of education pertaining to variables administrated in this study according to objectives by extraction of conceptual, theoretical and empirical review of them. A summary of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested (Best, 2001). Review of the literature accomplished for better understanding about the process of dealing with the variables in the current study which helps to fasten the research procedure and provides the conceptual framework for the study. To present the current knowledge pertaining to domain of research problem and to comprehend the research methodology design, the investigator reviewed the related literature, which coming in two major portions as follow:

Part one: Conceptual Literature contains foreign and local literature sources extracted from books, journalism, and other forms of material, focusing or relevant to the research, Which in this study pertaining to educational environment, educational satisfaction, learning environment, educational environmental standards, educational standards equipments and facilities, teacher job satisfaction, student satisfaction conceptual definition and theories.

Part two: Research Literature contains local and foreign empirically research extracted from published and unpublished scientific articles, theses and dissertations. This included: studies pertaining to educational environment effects on students and teachers satisfaction, student achievement and educational environments facilities, theory of teacher attrition and teacher retention, theoretic perspectives of university climate and the learning environment, history of school facilities, condition of educational standard environments, Universities and school facilities, teachers and students satisfaction, the factors of the performance and achievement on students and teachers, educational environments facilities and teacher retention, assessing
universities facilities, learning environment, university and school building design, characteristics.

2.2. CONCEPTUAL LITERATURE

2.2.1. EDUCATIONAL ENVIRONMENT

Explanation of the Concept of Educational Environment

The definition of "educational environment" includes a wide range of issues related to both the physical and the psychological factors which contribute to the learning process. (The 6th European School Student Convention educational environment, 2010).

Hill and Hulbert (2002), defined educational environment as the extent to which a teacher and students perceives and values various factors such as general environment, climate, noise, ceiling and electrical and walls.

Providing adequate resources and facilities is an educational environment (Bernard, 1999).

Educational facility. The process of conceiving and selecting the structure, elements, arrangement, materials, and so on for a school building or facility; the plan or layout of the building (Australian Council for Educational Research, 2008).

Successfully managing an educational environment is a necessary and essential educational investment. Research increasingly shows that there is a clear link between environmental quality of schools and educational performance:

- Facility management systems determine environmental quality in schools.
- The quality of the school environment shapes attitudes of students, teachers and staff.
- Attitudes affect teaching and learning behavior.
- Behavior affects performance.
- Educational performance determines future outcomes of individuals and society as a whole. The key findings of the work start with the identifiable and measurable
environmental conditions required of all high performance Universities and schools and the basic finding that an academically successful school must radiate a sense of well-being which is the essence of health. The information gathered for this case study clearly indicates there must be a serious, if not passionate, desire accompanied by positive action, to restore non-performing schools to a constantly healthy state. Effective restoration is achieved through good design that addresses total environmental quality to include general sanitation, good air quality, noise control, and lighting and glare reduction, soothing color, and general comfort provided by temperature and climate. The healthy educational environment is kept in a steady state only with a thoughtfully organized cleaning and maintenance program. When a school environment is transformed from a state of hopeless deterioration to a healthy condition, attitudes of the students, teachers, parents, and surrounding community turn energetically positive so as to allow for effective teaching and learning (Berry, 2002).

Student and teacher comfort is indicated as the most important aspect of any educational environment. If students are comfortable, then learning becomes much easier and teaching becomes effective and useful. Being comfortable is a combination of several different factors; adequate usable space, general environment, noise control, lighting, temperature and climate control, and sanitation.

2.2.2. Learning environment

Refers to the diverse physical locations, contexts, and cultures in which students learn. Since students may learn in a wide variety of settings, such as outside-of-school locations and outdoor environments, the term is often used as a more accurate or preferred alternative to classroom, which has more limited and traditional connotations—a room with rows of desks and a chalkboard, for example. Learning environment also encompasses the culture of a school or class—its presiding ethos and characteristics, including how individuals interact with and treat one another as well as the ways in which teachers may organize an educational setting to facilitate learning., by conducting classes in relevant natural ecosystems, grouping desks in specific ways, decorating the walls with learning materials, or utilizing audio, visual, and digital technologies. And because the qualities and characteristics
of a learning environment are determined by a wide variety of factors, school policies, governance structures, and other features may also be considered elements of a “learning environment.” Educators may also argue that learning environments have both a direct and indirect influence on student learning and teacher’s satisfaction and motivation to teach, including their engagement in what is being taught, their motivation to learn, and their sense of well-being, belonging, and personal safety. For example, learning environments filled with sunlight and stimulating educational materials would likely be considered more conducive to learning than drab spaces without windows or decoration, as would schools with fewer incidences of misbehavior, disorder, bullying, and illegal activity. How adults interact with students and how students interact with one another may also be considered aspects of a learning environment, and phrases such as “positive learning environment” or “negative learning environment” are commonly used in reference to the social and emotional dimensions of a school or class (Graet school partnership, 2013).

**Learning Environment Defined:**

The term *environment* denotes the totality of the surroundings and conditions in which something or someone lives or functions. A discussion about learning environments starts with a physical space, a virtual equivalent, or at least a set of organizational principles that had their origins in a conventionally space-influenced model. Whether a classroom, an island in a virtual domain, or a chat room in a learning management system (LMS), this core place features connections to other places and resources. These might be other learning spaces, but they are also likely to be places outside the educational world. A class in finance might, for example, include a real-time connection to a stock-trading floor. Technology can also provide an interactive, immersive experience, joining language students with native speakers via a teleconference or sending them on a virtual walk through ancient Roman buildings.

A learning environment consists of a wide set of features that affect learning. The idea of a learning environment implies a setting where intentions and design cannot account for everything that happens; some elements escape control or are at least unintended. Environment, then, is a mix of the deliberate and the accidental, the
conjunction of planned and unanticipated events. To some extent, traditional teaching in conventional classrooms could support this dynamic—students could be given assignments to take in directions that show mastery but also imagination and creativity. Now, however, with minimally mediated access to large amounts of information and with a substantially enhanced social dimension available to students, the set of directions students can take in their learning is far larger and growing. Some of this change is sanctioned by faculty; other parts of it reflect the environmental changes brought by technology and a tipping of control in favor of students regardless of faculty intentions.
Figure 2.1 a learning environment, classroom

Space becomes environment when it is stretched to include a broader sense of place, as well as the people who participate and the culture in which these elements are situated. The idea of environment invites a wider range of participants: administrators of various levels and functions, faculty, guest experts, librarians, IT staff, instructional designers, and learning theorists and researchers. The term implies a multiplicity of players, forces, and systems interacting. Environment is dynamic—changing in
response to influences from outside or arising inside. It recognizes complexity in causes and effects.

We know that different learning environments and institutional structures have a significant effect on learners themselves. But there are many discontinuities between school, further education, higher education and the workplace. Perhaps more effective learning contexts and linkages could be created. Such developments would emphasis the need for critically reflexive teachers, tutors and other staff who can support learners’ adaptation to new environments and respond to a diverse range of students.

Learning environments that support deep learning processes are likely to require extensive collaboration between different types of providers, whether schools, colleges or workplaces. Whether collaboration is facilitated or constrained is itself a system-wide issue. To meet the varying needs of pupils and to open a wider range of vocational options to more people, some proposals for reform presuppose a much greater degree of collaboration between schools, colleges and workplaces than we see today. Policy levers, funding and support all need to be in alignment if this ambition is to be achieved. Collaboration is expensive, whilst other policies, and factors such as the existence of performance tables, may act as a spur to competition between schools and colleges.

The field of learning environments has undergone remarkable growth, diversification and internationalization during the past 30 years (Fraser, 1998a). A striking feature of this field is the availability of a variety of economical, valid and widely-applicable questionnaires that have been developed and used for assessing students’ perceptions of classroom environment (Fraser, 1998b).

**Learning environment** is a virtual or physical setting in which learning takes place. Learning environments are typically constructionist's in nature. Some examples of good learning environments are schools, colleges and universities (ask, 2013).

**Place-based education**, sometimes called pedagogy of place, place-based learning, experiential education, community-based education, sustainability, environmental or more rarely, service learning, is an educational philosophy developed initially by The Orion Society. Place-based education seeks to help communities through employing students and school staff in solving community
problems. Place-based education differs from conventional text and classroom-based education in that it understands students' local community as one of the primary resources for learning (the nature literacy series, 2011). Thus, place-based education promotes learning that is rooted in what is local the unique history, environment, culture, economy, literature, and art of a particular place. Students need an engaging, stimulating, and enriching learning environment to grow and thrive. In order to achieve this type of rich environment, effective teachers establish and communicate guidelines for expected behavior, monitor student behavior, keep students on task, and infuse humor, care, and respect into the classroom interactions, so as to develop a climate that is conducive to student learning. And, as a result, research has indicated that a positive learning environment can shape student outcomes in cognitive, motivational, emotional, and behavioral domains (Fraser, 1982).

2.2.3 Objectives of designing and upgrading of educational environments are:

- Encourage interactive learning
- Provide comfortable seating with larger work surfaces
- Add multi-media audio-visual systems with good sight lines
- Provide a link to the Internet from every learning room
- Improve access for all persons
- Improve functional relationships
- Increase flexibility to respond to future needs
- Increase classroom use rates

- Increasing students and teachers motivation in learning and teaching process

2.2.4 21st century learning environment

What is a 21st century learning environment? The term “learning environment” suggests place and space – a school, a classroom, a library. And indeed, much 21st century learning takes place in physical locations like these. But in today’s interconnected and technology-driven world, a learning environment can be virtual, online, and remote; in other words, it doesn’t have to be a place at all. Perhaps a better way to think of 21st century learning environments is as the support systems that organize the condition in which humans learn best – systems that accommodate the unique learning needs of every learner and support the positive human
relationships needed for effective learning. Learning environments are the structures, tools, and communities that inspire students and educators to attain the knowledge and skills the 21st century demands of us all.

Educational experts say 21st century learning must take place in contexts that “promote interaction and a sense of community [that] enable formal and informal learning.” Cornell, P (2002). In this study, researcher addressed the relationship of physical spaces and technological systems to learning and educational satisfaction.

21st century learning environment as an aligned and synergistic system of systems that:

- Creates learning practices, human support and physical environments that will support the teaching and learning of 21st century skill outcomes
- Supports professional learning communities that enable educators to collaborate, share best practices, and integrate 21st century skills into classroom practice
- Enables students to learn in relevant, real world 21st century contexts (e.g., through project-based or other applied work)
- Allows equitable access to quality learning tools, technologies, and resources
- Provides 21st century architectural and interior designs for group, team, and individual learning.
- Supports expanded community and international involvement in learning, both face-to-face and online Such an environment fosters learning tailored to the needs and wants of the individual. This sort of learning occurs anytime and anyplace, when and where the learner desires. It takes place in a context of relevance, “just in time,” rather than “just in case.” And such learning offers “just what I need” – that is, the opportunity to acquire knowledge and skills through learning strategies that are personalized and adapted to the learner’s own learning styles and preferences. To guide policymakers, educational authorities, and school leaders, the Partnership has prepared this white paper to promote the vibrant educational environments – physical and online, technological and human – that support the 21st century learning all children deserve.
2.2.5 Importance of the educational environment

Educational environments are not primarily environmental showcases. Educational environments are special environments that exist for the purpose of enhancing the learning process. They are sensitively built environments housing very special segments of the population. A sensitive environment refers to a place that supports the activities of segments of the population who are very young, very old, or who are experiencing illnesses. From an environmental health perspective, a sensitive environment, such as a university or school or day care facility, tends to be where adverse health effects manifest themselves in the face of unsanitary conditions. In many center-city universities and schools, students and teachers far too often find themselves in a physical environment that adversely affects their morale, and, in some cases, their health and physical safety.

Unfortunately, learning excellence as measured in test scores alone tends to ignore the importance of the environmental quality in which learning takes place. Making cuts in routine cleaning and maintenance, repairs, and restoration is commonly considered less devastating than cutting academic programs. This limited thinking is very short-sighted, and, in the long run, ends up adding to the cost of education (Berry, 2002).

2.2.6 Conceptualizing the physical learning environment

The concept of “learning environment” will become increasingly significant as schools of the future become centers of lifelong learning. “Learning environment” is a term used liberally in educational discourse because of the emerging use of information technologies for educational purposes on the one hand, and the constructivist concept of knowledge and learning on the other (Mononen-Aaltonen, 1998). The OECD (2006) defines “educational spaces” as “a physical space that supports multiple and diverse teaching and learning programmers and pedagogies, including current technologies; one that demonstrates optimal, cost-effective building performance and operation over time; one that respects and is in harmony with the environment; and one that encourages social participation, providing a healthy, comfortable, safe, secure and stimulating setting for its occupants”. In its narrowest sense, a physical learning environment is seen as a conventional classroom and, in its
widest sense, as a combination of formal and informal education systems where learning takes place both inside and outside of schools (Manninen et al., 2007). Manninen criticized traditional school teaching for conveying too much theoretical information and for preventing in-depth learning. He claims that inert knowledge is relevant for exams but not for real-world problems. This idea is posing new challenges and exerting pressure to bring about changes in physical learning environments.

The concept of the physical learning environment with respect to physical structures relates to spaces, equipment and tools within the school. Lehtinen (1997, p. 21) suggests that the concept has evolved into an even more complex structure that includes teaching equipment, sources of information and events outside of schools, where students can take part in the learning process both directly and virtually. The term evolved as a result of the recent changes taking place in pedagogy, whereby actual learning has been transposed outside of schools thanks to developments in communication and information technology. Internet has already brought about significant changes in schools. Both the immense quantity of information available and easy access to social networks have weakened the link between schools and learning and therefore modified the traditional teacher-student scenario. The learning process is becoming more co-operative, changing the teacher into a learner too. Manninen (2007, p. 27) categorizes learning according to five different contexts: physical, local, social, technological and didactic.

The basic structure of teaching spaces does not seem to have evolved much over the past century. This fact inspired the research team to investigate the reason why, despite the recent changes in pedagogy and the widespread use of information technology inside classrooms and school spaces, the physical learning environment has not yet changed in keeping with this evolution.

In order to plan and construct effective physical learning environments, not only technical specifications need to be elaborated; qualitative aspects also need to be considered (Nuikkinen 2009). The concept of “quality design” has become critical the world over. It relates to school construction and, more particularly, defining a quality physical learning environment, measuring it and analyzing the results (OECD,
With regard to quality criteria for school building and design, the key actors are students; requirements are determined by specific age groups, in conjunction with societal needs and regulations relating to usability and safety (Heitor, 2005). It has been demonstrated that international comparisons of education can be achieved through comprehensive quality management and quality criteria (Finnish National Board of Education, 2008; OECD, 2006). As a result, the emphasis is shifting from developing physical learning environments using norms and regulations to comparing these environments on the basis of qualitative improvement (OECD, 2009).

A dynamic teaching space concept

The major purpose of the any educational environment, such as university, college, schools and etc, are to provide educational opportunities for learners. Students and teachers come together most frequently in the classroom. As such, our classroom environments should be designed to foster learning and the social construction of knowledge. Presentation and learning technologies have often been a part of classroom design, from chalkboards to Internet access and video projectors. The technologies involved in classroom design change frequently, and so this standard envisions a moving target. In this environment of flux, the university should strive to provide classroom environments using technology that promotes active participation, learning and assessment, and prepares students for the “real world” environments in which they hope to excel.
2.2.7 Educational physical environments

Universities and classrooms can be more than a place to inhabit: they can also acquire an emotional significance. One perspective is that educators play an important role in constructing classrooms and schools, and therefore students' identities. An extension of this idea is that children's environments have an effect on their cognitive and behavioral development and on childhood vulnerability (Ellis, J 2005).

Looking at educational environments is about more than the structures, it is about the social relationships within the space. Environment can be conceptualized as being an interaction between physical and social spaces. McGregor claims that the space is 'made' by the social aspects, (McGregor, J 2004:2). This attitude is increasing in popularity as we move again towards creating more open spaces to improve social interactions and student learning opportunities.

Spaces and how we organize them can tell students much about adult expectations and power structures. Similarly, a seminal work in the 1970s argued that 'a broadly academic ethos seemed to promote academic achievement' (Rutter, M 1979). Bunting also makes the link between the physical school environment influencing general attitudes to learning. He argues that if students do not leave school with a love of learning, they will be disadvantaged in today's 'knowledge society' (Bunting, A 2004).

2.2.7.1 Physical environment and student achievement

Studies about student academic achievement and building condition conclude that the quality of the physical environment significantly affects student achievement. 'There is sufficient research to state without equivocation that the building in which students spends a good deal of their time learning does in fact influence how well they learn' (Earthman, G 2004:18).

Desirable designs for learning environments include having 'friendly and agreeable' entrance areas, supervised private places for students, as well as public spaces that foster a sense of community, with particular attention to the color used (Fisher, K 2000 in McGregor, J 2004:2). Today's educational environments must create spaces that students want to go to, similar to the way cafes attract people, rather than the space being purely functional (Bunting, A 2004:12).
Other research has acknowledged that 'student achievement lags in shabby school buildings' but go on to say that this research 'does not show that student performance rises when facilities go from decent buildings to those equipped with fancy classrooms, swimming pools, television studios and the like' (Stricherzin Higgins et al 2005:36). In one study the significant improvements in the learning environment were attributed to the better attitudes to teaching and learning the improvements in the physical environment created amongst all users (Berry in Higgins et al 2005:14).

The relationship of school building conditions and student achievement is complicated. There are several variables that might affect the quality of building conditions and student achievement. Based on previous research studies, Cash (1993) designed a theoretical model showing some possible factors that affect the building condition and, in turn, affect student achievement and behavior. As figure 2.1 shown, Cash stated that leadership and financial ability have an influence on maintenance and custodial staff, which in turn, have a corresponding effect on school building conditions. Moreover, she stated that school building conditions influence the attitudes of students, parents, and faculty. The attitudes of the parents and teachers, particularly, influence students’ perception of the building. This can affect both the academic achievement and the behavior of students. Consequently, the condition of the university and school building, which is the result of administrative action and financial ability, influences the academic performance and behavior of students. This relationship between building conditions and student achievement has been linked to various components of the building, such as temperature control and ventilation, adequate lighting suited to the use of the space (e.g., incandescent, hot-white fluorescent, cool-white fluorescent, and full-spectrum), and wall color (e.g., white, pastel, or dark tones).
Facilitating teachers' work

Decent facilities make additional contributions to teachers work. Siegel has found there was a direct relationship between architecture and the collaboration of teachers. "The arrangement of space has immediate and far reaching consequences for teacher's ability to effectively and efficiently accomplish daily activities, the formation of social and professional relationships, and the sharing of information and knowledge" (Siegel, J 1999:4). Consideration of the spaces where teachers meet and collaborate is just as important as the design of the classroom (McGregor, J 2004:4). But it doesn't all have to be left to the architects. One study concluded that teachers who are more likely to modify their classrooms to produce what they believe is a more effective working environment are also more likely to collaborate with colleagues in the staffroom (Bissell, J 2004:29).
2.2.8 Designing educational spaces

As we know, there are many arguments in the research about the optimal teaching and learning spaces and their contribution to improving student achievement and satisfaction. These range from those who advocate de-schooling – pulling down the walls – to those who propose open space arrangements, to those whose research reports the benefits of more traditional classroom arrangements.

Horne challenges us to 'tear down the school walls' because students are being forced to learn in contexts so different from the world where they are required to put their knowledge to use. His view of schools as being similar to 'fortresses' is the cause of lower levels of parental involvement with schools and prevents the much needed improvement to parent/teacher and parent/parent relationships that in turn contribute to improvements in teaching and learning (Horne, M 2004:6). Stevenson also advocates schools being opened more widely for community use, but points out the implications of this on materials, design and maintenance (Stevenson, K 2007:3).

Advocates of open plan schools argue that students 'should be allowed to learn in ways suited to their individual differences' and that the most effective teaching and learning strategies allow teachers to work collaboratively with each other and team teach. The traditional classroom boxes with desks lined up in rows impede teachers' efforts to work in teams and have students 'in the flexible and varied groupings necessary' (Mark, J 2001:5).

Stevenson and Bunting also favour this approach, suggesting that 'traditional academic classrooms may disappear, replaced by holistic learning labs and exploratory centres' (Butin, 2000; Keep, 2002 in Stevenson 2007:3). Bunting agrees, saying that 'traditional classrooms must change' and proposes a model of a generic space for students to be co-located with teachers, which are decorated by the students to give them ownership, and teachers and students only move when necessary to access specialized space (Bunting, A 2004:11–12).

Weinstein and David question some of the implied benefits of open planning. 'Open space in and of itself does not have a universal effect' while others comparing open and traditional environments argue 'the essential elements were the school's
educational philosophy and physical layout, not merely the physical layout' (Higgins et al 2005:14).

2.2.8.1 Location & Dimensions of the Space of educational environment

The first questions when rethinking an educational space are:

- Is it located in the right place?
- Is it the size we want?

If the answer is no in either or both cases, consider the possibility of relocating to a different space, or reshaping the existing one. For a proposed new space, consider:

- Where should it be located?
- What size should it be?

To answer these questions, address and consult on such issues as:

- What do we want to do in the space?
- How many different types of activity do we want to offer?
- What areas do we want within the overall space (e.g. teaching and non-teaching, offices, toilets, reception area, lunch area)?
- How often will the space be used?
- How many children or adults do we want to cater for in a group?
- How many people will be involved overall?
- Based on the above, how much space do we need?

Where do we want the space to be, in relation to other spaces in the site (e.g. exhibition areas, staff offices, cafe or shop, gardens or dedicated outdoor areas, toilet facilities if not exclusive to the learning space, main entrance or a separate entrance)?

- Do we want the space to be situated in a central, public and highly visible location?

The educational environment as a whole has a huge influence on the location and dimensions of the learning space within it, in terms of its own geographical location, structure and shape. That influence extends to perceptions of learning in cultural sites. For example, the view that the whole site is a learning space may be valid but can also limit a site’s thinking about what a dedicated learning space should be for and where it should be. This is another justification for having an educational presence at senior management level, and on any project team for developing such spaces. At the same time, compromises have to be made for the simple reason that a fully flexible, useable
space is so difficult to design or rethink because something is always at the expense of something else. In addition, disadvantages relating to the location, structure and shape of the educational environment as a whole can create problems for or limit the potential of any new learning spaces within it. This can be particularly challenging with a listed building where conservation issues need to be considered and where innovation and radical thinking may be required more than for a brand new site.

Dimensions were controlled by the original building, as were the accessibility and location. Related to this is the need to build flexibility into a space, in terms of types of use and future development. Such problems should be addressed collaboratively between education team and project team – and any architectural team, in order to deliver a space that adheres as closely as possible to the agreed brief. Taking the time to understand the issues of location and dimension, and being helped to appreciate these, can enable the education team to resolve many difficulties in acceptable ways.

Most learning spaces in non-national sites are located on the ground floor, with others tending to be either on the first floor or in the basement. Nationalsites tend to favor basement locations for learning spaces. This can create problems of light levels as well as diminishing the visibility and status of education in the site and help to improve the quality of learning and teaching process. Each site must decide which floor best suits its own space. However, one crucial issue is accessibility. If a space is located above or below ground level, make sure there are lifts of a sufficient capacity to move people to and from that level quickly and easily. Allocated, consider the following:

• Opportunities for display
• Quality and level of available light
• Views outside the space
• Access to an outside space for activities and/or lunch area
• Ready access to basic services
• Level of external noise
• Easy access to toilets and potential lunch area
• Easy or dedicated access from the street
• Accessibility out of hours
• Opportunities for flexibility, adaptability and expansion
• Maximum number likely to use the space in a single session and over a year
• Amount of specialist equipment or furniture required.
• Range of activities and type of work to be offered
• Amount of storage required for equipment, materials, and users’ work
• Whether you need separate spaces for different purposes, e.g. dark room, or a handling area for valuable artifacts.

Check out what is possible within the allocated space. For example:
• Will every part of the learning space be accessible to all?
• How many people can work in it comfortably at the same time?
• How difficult will it be to move around in the space?
• What equipment and furniture can be accommodated within the space?
• Which activities can be run, and which cannot?
• How quickly will staff and users get a sense of how the space works?
• Will you have enough education and support staff to service the space?

**Services**
‘We wanted, and got, a building for learning and teaching that demonstrates best practice in terms of sustainability and enables people. The services you use, where they are situated in the space, and the methods by which they are delivered, depend on the kind of site or institution you are, the location of the learning space, the range of activities you want to offer, and the number of visitors to be catered for. Health & safety regulations cover the installation of services generally and for learning spaces. However, there is more to consider than the basic rules. One factor is to provide services in environmentally beginning ways. This includes arrangements for energy, water and waste. Researcher wanted, and got, a building that demonstrates best practice in terms of sustainability and enables people. The heritage status of a site, and the kind of artifacts on display or stored, also influences the type, use and location of services. Our case studies show that workable compromises can be reached between the need to protect buildings (particularly historic buildings) or displays, and the need to ensure that a learning space is properly equipped. General issues to consider include:
• Activities going on in the space
• Number of people involved in sessions
• Best locations for each service
• Convenience in relation to other fittings, furniture and equipment
• Health & safety.

• Number and size of each service point, e.g. sinks, power points, lights
  • Types of energy sources and methods of installation
  • Potential to adjust, extend and relocate
  • Cost and ease of maintenance

Consider also:

**Water**
• The need for hot and cold water
• Precautions to avoid flooding

**Electricity**
• The equipment needing electricity
• Where to locate power points, e.g. floor, worktop and/or ceiling level, and flexible points to be moved around the space

**Lighting**
• The balance between natural and artificial lighting
• The impact of natural light on the space, such as location, extent, dimensions and type of glazing, potential glare, and the need for blinds
• The type of lighting you need, such as ceiling lights, table lamps, directional lighting, and dimming options
• The need for effective blackout facilities

**Temperature control & ventilation**

The temperature and ventilation of a learning space are determined by such factors as the number of external walls, extent and type of glazing, ceiling height, and the type and location of heating systems installed. A further consideration is whether the materials or equipment used for activities in the space produce dust, fumes or heat. This includes ICT equipment, which can increase the temperature in an enclosed space. Some sites, such as archives and museums, have special requirements because
of the artifacts on display or in storage regulations set out minimum requirements for temperature and ventilation control in Universities and schools, and these should be applied to learning spaces in other settings. For example, a classroom should maintain a minimum temperature of 18°C (64.4°F). Location can be a significant factor. For example, underground spaces seem to be popular with some architects and directors but are often reported to feel oppressive, airless, and enervating. Consider the following:

• The impact of both natural and artificial lighting on the space
• The heating system to be installed in the space, especially its efficiency and ease of control
• Activities requiring ventilation to control dust, heat or fumes
• The benefits of access to fresh air, and whether you want to be able to open windows
• Whether windows require blinds both to cut out glare and to enable the use of TV/AV equipment

Toilets
The key issues about toilets are:

• Where they are sited. Can they be exclusively for those using the learning space, thereby addressing child protection issues?
• How they are fitted-out. Can they be wholly or partly designed and fitted-out specifically for children?

How many to install. Will they be used regularly through the day or only for a short span of time? Will they cope with the short periods of heavy use, e.g. 40 children in the space of a 15-minute break?

Acoustics
What you can do in a space can be limited by the quality of sound-proofing and acoustics. Some sites build both into the design and fitting-out; others accept a certain level of sound leakage, organizing sessions so that a noisy activity does not clash with a quiet one next door; and some enjoy the ‘inevitable’ hub-bub of a lively and successful learning space. Sound quality is vital, so consider:

• Shape and size of the space, including ceiling height
• Materials used in construction or fitting-out, e.g. glass walls
• Furnishings and equipment in the space
• Number of people who work in the space
• Type and variety of activities they will do
• Intrusion of noise from elsewhere in the site or outside it

Always test the effectiveness of sound-proofing or acoustic fittings or design. (Space for Learning, 2011).

2.2.9 Designs for Learning Environments

Perhaps the most fundamental guideline is “design for flexibility.” Since no one can predict how educational technologies and teaching modalities will evolve, learning spaces must adapt to whatever changes the future may hold. To achieve this flexibility, architects are designing educational environments, classrooms, or “learning studios,” with moveable furniture and walls that can easily be reconfigured for different class sizes and subjects, Sack-Min, J (2007). The University and school building itself should inspire intellectual curiosity and promote social interactions. Design Share, an organization devoted to sharing best practices and innovation in schools, sponsors an annual awards program to recognize outstanding school design across the world.

All projects shall follow the Design Phase Submission Requirements outlined in the University or any educational environment’s Design Guidelines & Standards Manual. Designs shall be sufficiently complete by the Design Development Submission to provide evidence that they fully comply with this Design Guidance for Learning Environments.

John Dewey long ago conceived of schools as “miniature communities” that mirrored the social relations and activities of the larger society in which they were set. Yet, too often, schools have been silos of isolation – classrooms isolated from other classrooms, teachers isolated from other teachers, schools isolated from the outside world. Research shows, though, those positive and productive relationships within and outside an organization enable it to carry out its mission more effectively. When people are connected through technology and/or collaborative arrangements, their
effect is multiplied, for communities “can accomplish goals that would be impossible through more isolated efforts.” (Dewey, J, 1899-1980)

We must re-design educational environments that reach far beyond the traditional classrooms many adults experienced when they were young. The learning environments of the 21st century must encompass a rich mix of media and devices, varied cultures, and virtual and real-life relationships. Policy must serve as the steering mechanism to guide the creation of learning environments that are both more expansive and more inclusive – spaces for learning that offer more people more access to more places and information while also allowing for close-knit social relationships among community members to flourish. Making all this happen is the task before us. It will not be easy, inexpensive, or quick. But it is essential.

2.2.10 Physical conditions for educational environments

There is a plethora of research that examines the effect of the physical conditions of teaching spaces (which includes seating, furnishings, spatial density, privacy, noise and acoustics, climate and thermal control, air quality, windowless classrooms, vandalism and play-yards, light and colour) on students' engagement, attainment, attendance and wellbeing (Keep, G 2002; Higgins et al 2005; Lackney & Jacobs, 2004; Gump 1987; McGuffey 1982; Earthman 2004; Sundstrom 1987; McNamara & Waugh 1993; and Weinstein 1979).

Some interesting contentions about the physical aspects of educational environments include:

• Temperature, heating and air quality are the most important individual elements for student achievement (Earthman, 2004).

• Chronic noise exposure impairs cognitive functioning, with numbers of studies finding noise-related reading problems, deficiencies in pre-reading skills, and more general cognitive deficits. (Higgins et al, 2004).

• 'Colour remains the topic of some of the most optimistic claims about morale and efficiency' (Sundstrom, 1987). According to some research, the choice of the best use of colors is dependent on the age of children (brighter for younger students, more subdued for adolescents), as well as differences between males and females (males –
bright colours, females – softer). Much research findings about colour is conflicting, and remains hotly debated (Higgins et al, 2004).

- Using visual displays in classrooms breeds success because 'students are provided with specific examples of how success is obtained' (Culp, B 2006).

**2.2.10.1 SITE AND SPATIAL RELATIONSHIPS**

Classrooms should be placed on the lower floors of buildings to provide better student access and more convenient instructional support services. A building with mixed functions (classrooms, offices, and/or laboratories) should separate the classroom core from other functions. Classrooms should be separated from noise-generating activities inside or outside the building. To reduce external noise, sound buffers must separate classrooms from areas such as streets, parking lots, housing areas, plazas or other areas where students gather, recreation sites, athletic fields, trash pickup sites, and loading docks. To reduce internal noise, classrooms should be isolated from building mechanical systems, elevators, restrooms, vending areas, and other noise generating areas.

**2.2.10.2 FACILITY DESIGN ELEMENTS**

The discussion of educational environment’s design guidelines must begin with a few general principles about the location of classrooms and the structures that contain them. This part emphasizes the design guidelines common to all types of instructional spaces. For specific guidelines on general purpose classrooms, lecture halls, and seminar rooms.

**Designing Physical Space**

Students and young children learn by doing and actively engaging with materials, equipment, and people in their learning environment. Creating a physical space that recognizes the developmental needs of five year olds provides a context in which optimal learning occurs. The choice and organization of classroom materials in the learning environment influences the way in which a kindergarten teacher guides a student’s development and sets the expectations for student engagement.

Akinsannmi (2008) discussed how it is impossible for school designers to create a perfect learning environment. Learning environments were often designed to suite or support particular learning theories that can explain the learning process. Many
researchers based their theories on physiological, psychological and sociological changes that take place when learning occurs (Saettler, 1990; Schwier, 1995). There were many learning environments that were often described in terms of social climate, curriculum design, and pedagogical philosophy (Akinsanmi, 2008).

Beliefs about how children learn and the environment in which they work should complement one another. The physical design of a developmentally appropriate classroom allows for experiences in areas for reading, writing, listening, dramatic play, art, numeracy, block, science, technology and an area for large group meetings. Ensuring a balance amongst these various learning areas is an important component in the organization and planning of the physical space in a classroom.

While classrooms may look different, the space should accommodate these learning areas so that children can learn to move independently throughout the room for the purpose of using the equipment and materials. The physical environment should anticipate individual, small group, and whole group involvement that provides a balance between teacher and student-initiated activities.

Learning must be connected across the curriculum and the real world in meaningful ways while experiencing the outside world. This is possible by participating in field trips and extending the learning to areas such as the gymnasium, music room and the outdoors. These learning areas do not have to be elaborate. Some of the best learning experiences grow out of trips in and around the school such as visiting another class to watch role plays, singing or poetry sharing, finding the signs on the rooms throughout the school, watching the snow plow clean the street, observing a bird eating from a birdfeeder, examining playground equipment, observing falling leaves, walking across the street to a wharf, a general store or a supermarket and picking flowers to give to a sick friend. The experience should allow for participation, close up viewing/observation, touching and questioning within the student’s level of thinking and reasoning while reinforcing, extending and enriching a student’s learning.

2.2.10.3 Buildings entrances

To reduce the impact of exterior noise and temperature differences, all building entrances should have two sets of doors, one from the outside into a vestibule and a
second from the vestibule into the building. The main criterion in determining where to locate building entrances should be the direction(s) from which students and other pedestrians approach the building. Entrances should be near classrooms to limit the distance students must travel through non-instructional areas to reach classrooms. Large numbers of students walking through hallways can disturb classes already in session. Larger capacity classrooms should be located closest to the building entry. Local building codes should be only one of several criteria that should determine the number and location of building entrances. Equally important is to plan for a flow of students between classes that is double the capacity of the rooms served by an entrance. Students often arrive for class at the same time students are leaving the classroom. If classrooms must be located on upper floors, the stair towers and the doors into stair towers must accommodate the number of students who may leave and arrive at the same time. Rooms with fewer than 50 stations normally should have a single entrance/exit. To facilitate movement of people and equipment, two entrances are preferred, and are required in rooms with a capacity of 50 or more. If achieving maximum room capacity is an objective, a single entrance at the front of the room will usually provide room for more student stations because entry space is incorporated into the instructor area. However, single entrances from the rear of the classroom reduce the disturbance caused by students arriving late for class. If only one entry is possible, it should be located at the front of the room. This single entrance should be on the side wall rather than the front wall so that it does not reduce the amount of space for boards and screens. All doorways should facilitate the easy passage of people with disabilities and should accommodate moving equipment into and out of the room.

### 2.2.10.4 Ergonomics and Furniture Selection

The reason many children fidget in their chairs is because they are forced to sit for long periods of time in furniture with poor ergonomics. The resulting stress placed upon their muscles, ligaments and vertebrae causes them to move around to seek relief. The classroom environment, including its furnishings, is not only an issue of comfort, but also of safety and learning. Research indicates that the type and characteristics of classroom furniture relate to the students’ overall health, behavior
and quality of education. One reason that students experience difficulty getting comfortable is that most classroom chairs are designed for an average height at a given age. Several researchers recommend that chairs and desks be selected based on a student’s political height (the measurement from the back of the knee to the floor). Milanese and Grimmer found, however, that seat heights are often too low for some of the larger students, causing the spinal column to be bent at unhealthy angles, Milanese, S., and Grimmer, K. (2004). Moreover, as students grow, their arms and legs may grow faster than their torsos in one year and vice versa the next. These findings suggest that separate body part measurements rather than average heights of students should be used as a general indicator when designing classroom chairs. School furniture that properly fits the children may alleviate physical strain and facilitate better postures for learning. Furniture should support students as they lean forward to read, write or draw, or lean back to listen or watch. Knight and Noyes (1999), recommend a divided seat that slopes both forward and back, higher tables, backrests and footrests on tables to encourage on-task behavior and proper sitting positions (Knight and Noyes, 1999). Indeed, school environments should be held to the same standards as workplace environments, offering a variety of seating options, as well as furniture that is adjustable, particularly in seat height. If a child is experiencing musculoskeletal pain and fatigue, he or she will be more focused on easing that discomfort than on the subjects to be learned.

2.2.10.5 Environmental Issues

Due to many medical situations, which will be referred to collectively as cardiopulmonary medical problems, fresh air or clean re-circulated air must be provided for classrooms. This means that windows and fresh air intakes for the buildings and classrooms be located away from loading docks, mechanical areas, exhaust vents, roadways, and other sources of potential irritants. Persons with allergies often have problems with chemical aromas, including carpet glue, paint, and roof tar. Use of these in or near general classrooms should be minimized whenever possible, and adequate “airing out” time must be provided before scheduling classes in the rooms. Flickering of fluorescent lights can trigger seizures in persons with
epilepsy and other neurological disorders. Regular inspection and/or replacement of ballasts and tubes can help eliminate this potential problem.

2.2.10.6 Room Design, Furnishings, and Equipment

Room Location

Learning rooms shall be located as close to building entrance levels as possible to improve access and reduce noise levels in other parts of the building. Large learning rooms shall be located close to primary building entrances and circulation spaces that are large enough to accommodate students waiting for the next class. Where existing learning spaces do not meet these goals, rehabilitation projects should relocate them, add entrances, or create more spacious circulation elements with places for students to sit while waiting for the next class. The location of learning rooms in relation to natural light should also be considered. Rooms with windows facing north can be more easily designed to provide adequate blackout capability and energy-efficiency than rooms with windows facing other directions. Passive solar design features should be considered for rooms where windows face the sun.

Room Size and Proportion

Learning spaces need to be large enough to comfortably accommodate the number of students planned for each type of room using the types and sizes of furnishings anticipated for teachers, students, and audio-visual components. Campus Planning shall be involved in any discussions that arise in design that could potentially change functions or seating capacities.
The following space standards and furnishings types shall be used to estimate the total usable floor area of learning rooms during the programming phase of a project:

<table>
<thead>
<tr>
<th>SF Per Student</th>
<th>Capacity</th>
<th>Room Type</th>
<th>Furnishings Anticipated</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>20</td>
<td>Seminar Rooms</td>
<td>Movable tables &amp; chairs</td>
</tr>
<tr>
<td>22</td>
<td>32</td>
<td>Classrooms</td>
<td>Movable tables &amp; chairs, Movable tables &amp; chairs</td>
</tr>
<tr>
<td>20</td>
<td>40 or 48</td>
<td></td>
<td>Fixed writing surfaces &amp; movable chairs</td>
</tr>
<tr>
<td>21</td>
<td>60-90</td>
<td></td>
<td>Fixed writing surfaces &amp; movable chairs</td>
</tr>
<tr>
<td>20</td>
<td>100-119</td>
<td></td>
<td>Fixed writing surfaces &amp; movable chairs</td>
</tr>
<tr>
<td>19</td>
<td>120-199</td>
<td></td>
<td>Fixed writing surfaces &amp; movable chairs</td>
</tr>
<tr>
<td>18</td>
<td>200-299</td>
<td>Auditoriums</td>
<td>Fixed writing surfaces &amp; movable chairs</td>
</tr>
<tr>
<td>16</td>
<td>300-399</td>
<td></td>
<td>Fixed writing surfaces &amp; movable chairs</td>
</tr>
<tr>
<td>14</td>
<td>400-650</td>
<td></td>
<td>Auditorium seats with tablet arms</td>
</tr>
<tr>
<td>40</td>
<td>25-40</td>
<td>Computer Instruction Labs</td>
<td>Computer stations/conventional monitors</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td>Computer stations/thin-profile monitors</td>
</tr>
<tr>
<td>35-60</td>
<td>varies</td>
<td>Other Instruction Labs</td>
<td>Furnishings and space needs depend on function and discipline</td>
</tr>
</tbody>
</table>

**Table No. 2.1. Space standards and furnishing types**

Furnishings layouts shall be developed during schematic design to insure that the room sizes and shapes proposed comfortably accommodate the number of students programmed for each room. The shape of the room, size and types of furnishings proposed, and other design features may increase or decrease the amount of space required per student. Room proportions also have a significant impact on seating capacity, sight lines, and the ability of instructors and students to interact with each other, even in small rooms:

- Classrooms and auditoriums that are too wide make it hard for instructors to maintain eye contact and typically have poor sightlines (especially from seats in the front corners).
- Instructor areas often provide more space than needed.
- Classrooms and auditoriums that are too deep make it hard for students in rear rows to interact with instructors and other students, hear what is said, and see projected images or marker boards. Instructor areas may be too narrow for screens and marker boards.
Seminar rooms with rectangular shapes and long, narrow tables make it hard for students and instructors to see each other, projected images, or writing on marker boards. When instructors sit at the head of the table to improve eye contact, this makes it more difficult for them to encourage students to actively participate in the discussion (learning environment design guidance, 2003).

2.2.11 CLASSROOMS

The classroom is the most important area of a university and school (educational environments) because it is where students and teachers spend most of their time and where the learning process takes place. The following conditions help make the classroom a better place in which to learn. Lighting in classrooms must focus on the front of the classroom and over the student’s desks. Glare from hard surfaces is distracting and should be avoided wherever possible. The effective lighting of educational environment has been related to high performance test scores time and again.

Classes should be designed to accommodate students so that the number of students does not exceed 20. A lower density of students per classroom will increase teacher and student interaction and communication. Classrooms must be designed with effective communication and interaction in mind. Students should be able to easily see and hear the instructor and other students. Noise must be controlled to levels that do not exceed 68db. At about the 68 or 69 db noise level, students begin to have difficulty understanding what is being said and are distracted by noise in other classrooms.

Technology is at the center of the modern educational process, especially for mathematical and analytical skills. Computers in classrooms are very important. Tools, such as the Internet, allow the smooth exchange of information between student and machine, but must be positioned and used in environments that do not cause distraction. Increasingly, students can learn through virtual classrooms when no teacher is available. Comfortable surroundings aid in this form of learning.

Temperature and indoor climate is also important. A temperature of 68-72 degrees is ideal and should be maintained year round. Educational environments must be designed with good ventilation. Effective filters and cleaning must be functional so as to keep particulate matter, such as dust, out of the air. Odors can also be distract
students, but can be removed with good ventilation. The design of schools is a very important factor when dealing with sanitation related to moisture. Building roofs that leak or will not stop water are detrimental. Water in classrooms leads to mold which can cause allergic reactions. High humidity and standing water also creates an environment favorable to all kinds of bacteria, which can spread diseases. The cleanliness of educational environments is also an important aspect of universities environments. Clean universities schools not only lower the threat of the spread of illness, but also convey a caring message to the students and teachers. Cleaning and maintenance of educational environments is vitally important and is often underemphasized and underperformed. Students feel better going to clean classes and sitting in clean desks and surroundings. Sanitation in universities and schools is important because young children face unique health hazards, especially respiratory infections, asthma attacks, skin disease, and diarrheal outbreaks. A educational environment should be one in which every student feels safe. Many educational environments today work with local law enforcement agencies to put security officers in schools. The presence of security officers often gives students a sense of safety and security. In the final analysis, the primary environmental policy and management objective of every university and school (educational environment) facility should be that of taking whatever steps are necessary to create a “sense of well-being.” By definition, this is a healthy environment. “Health is the state of complete physical, mental, and social wellbeing” (Berry, 2002).

To develop classrooms with good sight lines and efficient seating layouts, design professionals should design from the “inside out”, not from the “outside in”:

• Determine number of screens based on seating capacity, room type, and teaching goals
• Determine the general location, size, and orientation of each screen and the seating area
• Insure the instructor area meets the minimum dimensions in this guidance
• Draw “viewing angles” from each screen and insure all seats are within them
• Determine optimum width and depth of the seating area based on seat spacing guidance
• Determine the location and size of access aisles
• *Then* decide where the walls of the learning room should be located (*learning environment design guidance, 2003*).

![Classroom](image)

**Figure 2.4. Classroom**

As researcher mentioned general purpose classrooms are defined as those seating 20-75 students and having at least 350 square feet of space. These rooms are by far the
most numerous and must be carefully designed and equipped if they are to provide the appropriate learning environment.

Classrooms should be designed so that all students have good viewing angles. Rooms that are too wide or too narrow create wasted space and/or unacceptable viewing angles for projected materials and for the chalkboard. With increased use of projected images, the shape and dimensions of classrooms are more critical than ever before.

There should be no obstructions (such as columns or posts) anywhere in the classroom. The front wall of the room behind the instructor area should have no protrusions into the room so that a chalkboard/ marker board can be installed across the entire wall of the instructor area and that screens can operate without obstructions.

Ceiling heights will vary depending upon the size of the room. The following are suggested minimum ceiling heights that allow for projected images to be seen.

2.2.11.1 Classroom Design

Today, technology and an increased emphasis on undergraduate education have rekindled interest in classroom design. Institutions now invest significant amounts of scarce funds to "bring classrooms into the modern century." Colleges and universities recognize that to recruit and retain good students and faculty, modern and well-equipped instructional facilities are as important as modern and well-equipped research facilities.

A fundamental tenet has guided each of the three editions of this publication. Students have a fundamental right to a classroom learning environment that allows them to see anything presented visually, to hear any audible presentation free from noises and distortions, and to be physically comfortable (air flow, temperature, furniture, etc.) regardless of the method of instruction used. Any classroom design plan should first meet these requirements before meeting other needs. Likewise, any existing classrooms that do not meet these basic criteria should be renovated whenever possible or if the problems cannot be adequately addressed, they should be removed from the classroom inventory (classroom design Manual, 2004).
Figure NO 2.5. Impact of room proportions on eye contact and sight lines
The size of the instructor area in the front of the learning room is another important design consideration. This area should be:

- Deep enough to accommodate a multi-media instructor workstation and a reference table and provide ample circulation space between the workstation and screens, marker boards, and the seating area.
- Deep enough for carts used for portable media projectors to be located far enough from screens to project images without a keystone shape and large enough to be easily seen.
- Wide enough for marker boards and at least one projection screen to be used at the same time spaced far enough apart so that light on the board does not spill over onto the screen.
- High enough to give all students a clear view of projected images.

These parameters suggest teachers areas in classrooms with up to 48 seats should be at least nine feet deep and 24 feet wide. Deeper instructor areas are typically needed in rooms with multiple screens, higher seating capacities, and portable projectors.

![Figure 2.6 Teachers area's in classroom](image-url)
To provide good sight lines to projection screens, ceilings in classrooms with flat floors should be at least 13 feet high in front of the screens. Ceilings in tiered floor classrooms also need to be at least 13 feet high in front of screens to insure that light from the projector will not be in the instructor’s eyes. Lower ceilings may be considered in tiered-floor rooms that have no screens located behind the instructor workstation. Figure 2.7 Good sights light of projection
A classroom’s atmosphere, shape and arrangement of space and furniture are all vital considerations in the effectiveness of the environment for learning. Overall classroom satisfaction is associated positively with appropriate temperatures, optimum lighting and noise levels, greater personal space and varying ceiling heights. For example, a study by Hygge and Knez of college students revealed that memory was optimized when the classroom was at 21 degrees Celsius (approximately 70 degrees Fahrenheit); lighting levels were at about 1500 lux and the noisedecibel rating did not exceed 38.1. Behaviors related to classroom size also come into play. Classroom size can have a direct relationship on density levels and thus on student perceptions of crowding. As schools consolidate and enrollment increases, many classrooms that were already too small have become overcrowded, resulting in limited options for arranging the room, more aggressive behavior from the students and greater demands on resources to maintain the environment. Although larger classrooms are more spacious, offer greater flexibility and can accommodate more uses than smaller ones, it does not necessarily follow that larger classrooms are always better. If not overcrowded, smaller classrooms allow for more class participation and group discussion. Studies have found that teachers tend to experience more visual and kinetic distractions in large rooms with high ceilings, most likely because there is simply more space to supervise and the larger space inhibits focused attention and students having better emotion to study also. On the other hand, students tend to experience more kinetic distractions but fewer visual distractions in rooms with lower ceilings, presumably a result of focusing attention on one person at the front of the room. Rectangular rooms are preferable because they provide a narrower field of vision for teachers to monitor, while square rooms require them to check left and right more often at more dramatic angles (and round rooms are horrible acoustically). Research also shows that rectangular-shaped rooms afford more interactive visibility, while L-shaped rooms or rooms with alcoves accommodate privacy needs of individual learners. One option to consider is a room with movable wall partitions, as they enable teachers to reconfigure the room into many different shapes (Hygge, 2001).
2.2.11.2 Organizing classroom space

There is a volume of research that suggests 'less attentive and less successful pupils are particularly affected by the desk arrangement, with their on-task behavior increasing very significantly when seated in rows instead of tables' (Higgins et al 2005:26).

At a more erudite level researchers argue that teachers require a good knowledge of their students to implement an effective seating arrangement. Seating arrangements can be territorial (space organized by individual desk ownership) or functional (space organized, a specific activity). There can often be an 'action zone' where an increased involvement between teacher and students occurs across the front and down the middle of the room (Higgins et al, 2005:6 Weinstein 1979:), whereas some favour a horseshoe formation to overcome the fact that often when clustering students, group size and placement can be driven more by furniture and arrangement than pedagogy (McNamara & Waugh, 1993 in Higgins et al, 2005:26).

It may be that a 'one size fits all' model or solution is not possible. It seems that different arrangements are required for different teaching and learning contexts. What researchers do agree upon is that it is imperative for a school to have a clear vision in order to design facilities which can accommodate this (Stevenson, K 2007, Higgins et al 2005).

2.2.11.3 Design Criteria – Classrooms

Good classroom design begins with good classroom management, organizing the various campus units responsible for all aspects of classrooms to work together effectively, and establishing policies that encourage cooperation and teamwork. Only with a collaborative organizational approach to planning will classrooms be designed to facilitate the instructional mission. This means that the focus of all classroom design efforts must be the users, both students and faculty.

• Design of classrooms should meet the true needs of the teachers and students who will use the room rather than simply replicating what was done on previous projects or making compromises that have a negative effect on the quality of the learning environment;
• Support should focus on providing faculty with better assistance for
using technology in classrooms not just providing more and better technology (classroom design Manual, 2004).

2.2.11.4 General Guidelines of classroom

1) Unless the program dictates, locate classrooms and auditoria on ground and lower floors, convenient to building entrances/exits that provide direct pathways to other instructional and student buildings.

2) Classrooms should be buffered from internal building noise (e.g., student lounges/vending machine areas) and exterior building noise (e.g., loading docks.)

3) Adequate restrooms (per Facilities Services Design Guide) shall be located convenient to classrooms but not directly adjacent to classrooms.

4) Classroom corridor doors shall have noise reduced closure mechanisms. Entrance/exit door(s) to the room shall be located to minimize disruptive noise from Late-comers. Doors shall have adequate light seals to prevent light from outside the room striking the projection screen.

5) Size room entrance doors to handle double the room capacity to allow simultaneous entrance/exiting during class break periods.

6) Hallway floors and room entrances shall be barrier-free to comply with ADA requirements and allow free movement of equipment carts. Rooms with sets of doors with intervening foyer space should be equipped with automatic door openers.

7) Corridors and auditoria lobby shall be sized to accommodate waiting students and encourage post-lecture discussion/impromptu gatherings. Chalk/whiteboards shall be considered for these areas.

8) Built-in corridor/lobby seating, adjacent to classrooms, shall be included per program to encourage small group discussions and pre- and post-class group interaction.

Recommendations for room length and width dimension for the different configurations can vary significantly, and shall be determined interactively with the design team. A general guideline is to size classrooms in a 2:3 or 3:4 widths to length ratio.
10) Seminar/Breakout rooms are generally recognized to be either rectangular or almost square with little distinction of a “front” side of the room.
11) Classrooms (used extensively by instructors using audio-visual/multimedia presentations) shall be designed with the length dimension of the room approximately 1.5 times the width dimension. (Rooms wider than they are long provide unacceptable viewing angles for projected media.) An open “front” area of the room shall be clearly defined.
12) No seat shall be more than 45 degrees off the center axis of a classroom to ensure adequate viewing to the chalk/white board(s) and projection screen(s).
13) Case Study rooms (used primarily for discussion/case study instruction) can be squarer than rectangular in shape. A “front” area for the Instructor should be clearly defined. However, unlike multi-purpose classrooms, if the room is rectangular, the instructor’s area should be along the wider wall of the room and extended into the center “U”.
14) Auditoria and classrooms with over 100 seats may be fan-shaped to provide clear viewing angles and acoustics. A “front” area for the Instructor shall be clearly defined (Please refer to the minimum clearances information between the teaching wall and first row of seating later in this document.)
15) In general avoid center aisles to provide the maximum seating area with the best viewing angle.
16) In classrooms with fixed seating, stagger the seats to provide clear viewing angles.

Maximum incline of sloped floors should comply with ADA regulations. The depth and slope of rooms have a direct and critical impact on the required floor to ceiling height of rooms. The farther away the last row of seats is from the front wall of the room, the higher the ceiling must be to accommodate the appropriately sized projection screen for the room.
The following table lists recommended minimum ceiling heights (at the front wall of room): **Table No.2.2. Minimum ceiling heights for classroom at the front of wall**

<table>
<thead>
<tr>
<th>Distance to last row of seats:</th>
<th>Minimum Screen Size</th>
<th>Minimum Floor to Ceiling Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15 feet</td>
<td>70”x70”</td>
<td>8 feet</td>
</tr>
<tr>
<td>15-18 feet</td>
<td>70”x70”</td>
<td>8 feet</td>
</tr>
<tr>
<td>18-21 feet</td>
<td>70”x70”</td>
<td>8 feet</td>
</tr>
<tr>
<td>21-24 feet</td>
<td>8’Hx10’W</td>
<td>10 feet</td>
</tr>
<tr>
<td>24-27 feet</td>
<td>8’Hx12’W</td>
<td>10 feet</td>
</tr>
<tr>
<td>27-30 feet</td>
<td>8’Hx14’W</td>
<td>11 feet</td>
</tr>
<tr>
<td>30-35 feet</td>
<td>10’Hx16’W</td>
<td>12 feet</td>
</tr>
<tr>
<td>35-40 feet</td>
<td>10’Hx18’W</td>
<td>13 feet</td>
</tr>
<tr>
<td>40-45 feet</td>
<td>12’Hx20’W</td>
<td>15 feet</td>
</tr>
<tr>
<td>45-50 feet</td>
<td>12’Hx20’W</td>
<td>15 feet</td>
</tr>
<tr>
<td>55-60 feet</td>
<td>14’Hx26’W</td>
<td>17 feet</td>
</tr>
<tr>
<td>60-65 feet</td>
<td>16’Hx28’W</td>
<td>19 feet</td>
</tr>
<tr>
<td>65-70 feet</td>
<td>18’Hx30’W</td>
<td>21 feet</td>
</tr>
<tr>
<td>70-75 feet</td>
<td>18’Hx32’W</td>
<td>21 feet</td>
</tr>
<tr>
<td>75-80 feet</td>
<td>20’Hx34’W</td>
<td>23 feet</td>
</tr>
</tbody>
</table>

An area of the room shall be kept clear of student seating to provide adequate space for a teaching area for the instructor. Approximately 10 feet of open space from the front wall of the room to the front edge of the first row of student seats shall be provided.
19) Provide an area to accommodate the University’s standard podium, a sturdy 24”x60” table, a chair and audio visual equipment as specified by CSS staff. The front area must be large enough to give a minimum of 42” for instructors to stand behind the podium and/or desk and still allow free movement of students between the front of the podium/desk and the seats.

20) Provide adequate area for the instructor to have free movement around the front of the room with access to the chalk/white boards, audio-visual equipment, lectern/podium, equipment control system, lighting controls, etc. The students shall have a clear view of the instructor at all times. Conversely, the instructor should be able to make eye contact with any student in the room during presentations (including multi-media presentations), discussions and lectures.

22) In Level “C” and “E” rooms, (technology ratings are defined below) the equipment control system touch panel (to control lights, motorized screens, and other remotely controlled equipment), shall be located either on the podium, or wall location, as specified by CSS staff.

23) The furniture type for classrooms can vary depending on the size of the room and Pedagogical needs of the instruction. All furniture products shall be approved by CSS. Major selection criteria for selecting classroom seating include comfort, durability, and ease of maintenance and availability of spare parts. General guidelines for furniture are:

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Furniture Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar/Breakout room</td>
<td>Conference table and individual chairs.</td>
</tr>
<tr>
<td>Multi-Media or Lecture-style Classroom</td>
<td>Moveable 24” x 60” tables (2-person) and individual chairs.</td>
</tr>
<tr>
<td>Distance Learning (technology) Classroom, Case Study Room</td>
<td>Fixed pedestal tables and moveable individual chairs.</td>
</tr>
<tr>
<td>Computer Classroom</td>
<td>Variable Fixed riser-mounted seating with folding tablet arm.</td>
</tr>
<tr>
<td>Auditorium</td>
<td></td>
</tr>
</tbody>
</table>
24) Rooms with more than 60 seats shall have sloped or tiered floor unless otherwise noted.

25) Fixed seats shall be a minimum of 22-inches wide. Fixed or folding tablet arms shall have a minimum area of 150-square inches of writing surface. All fixed seating shall allow students to pass in front of an occupied seat to reach an open seat without requiring the seated person to stand.

26) Approximately 10 percent of seats shall have tablet arms that accommodate left handed people.

27) Stations for disabled students (wheelchair bound students) shall be provided per current ADA and State of Washington requirements. Stations shall be included at both the front and rear of the room and placed within the rest of the seating area. A hand-cranked height adjustable table will be provided at all ADA locations.

28) The last row of fixed seats shall have a minimum clearance of 6 inches from the back of the seat to the last riser/wall to accommodate installation of the furniture (University of Washington, 2008).

2.2.11.5 Small Classrooms

Small classrooms vary in size from about 20 to 39 student stations (see charts on following pages). These classrooms are small enough to permit flexibility in seating arrangement and can accommodate various teaching formats discussion, small group interaction, demonstration and lecture. Small classrooms are usually equipped with movable student seating, tables and chairs. Small classrooms should have an identifiable teaching wall with marker/chalkboard, one or more projection screens, and telephone/data connections. Whiteboards and whiteboard paint is encouraged. Paint should be contained by a frame so that occupants cannot write on areas that are difficult to clean. An instructor’s station with desk or table, chair, and table or floor lectern should be located near the teaching wall.

2.2.11.6 Large Classrooms
Large classrooms vary in size from about 40 to 79 student stations (see charts on following pages). Classrooms of this size are usually equipped and configured for instruction in the lecture format. At the upper end of the size range, sloped or tiered floors should be considered to improve sight lines. Moveable seating with fixed tables is generally required to maintain aisle widths established by fire and life-safety codes. Large classrooms have one identifiable teaching wall with a main marker/chalkboard, one or more projection screens, and telephone/data connections, and controls. An instructor’s station with desk or table, chair, and lectern (possibly equipped with lighting, sound, and audio-visual equipment controls) should be located near the teaching wall. Please check with the user groups of the space on the placement of boards. Whiteboards and whiteboard paint are encouraged. Paint should be contained by a frame so that occupants cannot write on areas that are difficult to clean.

2.2.11.7 Color and effects on the Classroom

Color in the learning environment provides an unthreatening environment that improves visual processing, reduces stress, and challenges brain development through visual stimulation relationships and pattern seeking. Visual stimulation actually rewires the brain, making stronger connections while fostering visual thinking, problem solving, and creativity (Simmons, 1995). Color variety reduces boredom and passivity. Therefore, classrooms should incorporate a variety of colors (based on age, gender, subject and activity) to reduce monotony and visually refresh perception. However, overuse of color using more than six colors in a learning environment strains the mind’s cognitive abilities. Color improves attention span by avoiding a monotonous environment and helping the student stay focused through mental stimulation, thereby increasing productivity and accuracy. Eyestrain, contrast, glare, minimal distraction, degree of stimulation and degree of concentration are impacted directly by color. Color can alter perception of time, increase school pride, reduce disruptive behavior and aggression reduces vandalism, reduce absenteeism, and provide a supportive background for the activities being performed. Color in architecture has multiple aesthetic and functional applications. Warm colors can be used to reduce the scale and size of large spaces, making them more intimate. Cool colors visually enlarge a space, making it less confining. Color can be used to
differentiate, contain, unite, equalize, and emphasize the design elements of a space. For example, color can make a high ceiling appear lower (dark colors), enhance visual interest and focal points while relieving eyestrain, accent entrances and exits for safety and identity, and ultimately create a unique sense of place that welcomes the learner and the community. Color can be used to modulate a building’s appearance to bring it into harmony with its surroundings, make a building appear pleasant or oppressive, correct proportions, eliminate monotony, and establish individuality among like buildings or building elements. Pattern is the repetition of shapes or forms and is an immediate concomitant of color. Patterns can be flowing (meandering), branching (deviating), spiraling (winding), geometric (rectilinear, angular, polygonal), or a mix of all of these. Floor patterns may be used to visually enliven, foreshorten, widen, or narrow a hallway. It can be used to denote entrances and exits, accent architectural elements and details, or create “rhythm” in a space. Patterns can establish visual focal points on wall and floor surfaces, imply static or dynamic movement, and convey a preferred emotional response. Large-scale spaces such as lobbies, cafeterias, or assembly areas should have patterns to match the scale of the space, while providing a neutral background for seating. Lobbies and primary entrances should be inviting and exciting. In spaces for emotionally handicapped children, regular geometric patterns should be used to reduce visual stress and stimulates the brain in pattern seeking. Discordant colors and irregular patterns are disturbing visual elements that distract and confuse such learners. Response to color is both physiological and psychological and is formed from a variety of sources (Wagner Institute for Color Research), which often are contradictory and overlapping:

- Inherited-physiological
- Learned-linguistic, religious, political
- Geographic-natural environment
- Regional-cultural
- Natural light-light modulation
- Climate-circadian rhythm and latitude
- Socioeconomic-social strata
- Sophistication-experience and style
**Color Physiology**

Colors produce different physiological responses in blood pressure, heart rate, respiration, digestion, body temperature, and brain activity. Even blind individuals, as confirmed by neuropsychologist Kurt Goldstein, have skin that “sees” in Technicolor, (dermo-optic vision), and they experience different physiological sensations under different colored lights. Colorblind and blind-folded subjects also can distinguish color and shape. Since electromagnetic wavelengths below red (infrared, radio waves) and above violet (ultraviolet, X-rays, gamma rays) have a physiological impact, there is evidence that the electromagnetic waves we actually see (visible spectrum) can also impact our well-being. Understanding these effects is the result of research on melatonin and serotonin, both hormones produced by the pineal gland in the brain. Melatonin, a depressant, is produced at night and is associated with responding to light, the reproductive system, and time synchronization of bodily functions. Serotonin, a stimulant, is produced by day and is an important neuron transmitter. Research has confirmed that certain parts of the brain are not only light sensitive, but also respond differently to different wavelengths (colors). It is believed different colors interact differently with the endocrine system to stimulate or reduce hormone production. **Chromotherapy,** or using color to heal (also known as light therapy or color logy) has had a long and difficult history. Originally developed by the ancients (India, Greece, China, Egypt), it is increasingly being used today to complement both conventional and holistic/alternative medical treatments.

Paracelsus, physician and alchemist during the Renaissance, regarded light and color as essential to good health and used them in treatments. In 1876, physician Augustus Pleasanton published *Blue and Sun-Lights*, reporting his findings on the effects of color on plants, animals, and humans. He particularly was noted for his studies of the effect of blue light on grape production. In 1877, another physician, Edwin Babbitt, advanced a comprehensive theory of healing with color. In the 20th century, color was introduced into the classroom for therapeutic effects. This practice was based on the work of Rudolph Steiner, founder of the Waldorf school system.
Steiner’s work was continued by researcher Theo Gimbel, who explored the claims of Max Luscher, head of the Institute of Psycho-medical Diagnostics in Lucern, Switzerland. Luscher was convinced that color preferences demonstrated a state of mind and were related to metabolic rate, glandular secretions, and autonomic responses. In the 1940s, Russian scientist S.V. Krakov established that the color red stimulated the sympathetic nervous system, while blue stimulated the parasympathetic nervous system. During the 1950s, Dr. Mhairi G. McDonald treated neonatal jaundice successfully with blue light. In 1958, psychologist R.M. Gerard found that red produced feelings of arousal and was disturbing to anxious or tense subjects, while blue generated tranquility and well-being. Gerard also discovered blood pressure increased under red light and decreased under blue light, relating blood pressure changes to changes in light wavelength. Harry Wohlfarth, late president of the International Academy of Color Sciences, found expanded relationships between color and changes in blood pressure, pulse, and respiration rate. In 1990, the annual conference of the American Association of the Advancement of Science reported on the successful use of blue light in the treatment of a wide variety of psychological problems, including addictions, eating disorders, impotence, and depression.

Color can have a positive or negative affect. Therefore, specific colors and amounts of colors are used to treat specific parts of the body. Light therapy is used to treat depression and sensory affective disorder. In the 1970s, German naturopathic physician and acupuncturist developed esoteric color puncture, using light similar to acupuncture to restore the body’s health. Color has been shown to alter alpha brain wave activity (alertness) and the production of hormones that affect mood, energy level, and mental clarity. As a result of NASA research on space shuttle plant growth, PDT or photodynamic therapy using LED (light emitting diode) technology has been shown to speed the early phase of wound healing (Medical College of Wisconsin), activate light-sensitive cancer drugs to increase their effectiveness, and improve human cell functioning to counteract the debilitating effects of weightlessness experienced by astronauts. There also have been promising medical research results with light on a variety of cancers and tumors, and pulsed LED red light has been used to reduce the pain of radiation therapy in breast cancer treatments.
therapeutic effect, experiments have been undertaken to associate particular sounds with colors or translate particular colors into sounds or sound patterns to provide a more comprehensive treatment experience. There also is evidence that physiological arousal may be more related to color saturation and brightness than hue, or be a result of mood associations to light (Vining 2003).

Engelbrecht argues that we have a basic, biological reaction to colour and that ‘the psychological reaction to colour does not preclude the basic biological reaction that stems from human evolution’. (2003). Colour transmitted through the eye is argued to affect mood, mental clarity and energy levels. Camgöz et al. (2003) suggest that bright colours on any colour background attract an individual’s attention. It has been asserted that when an individual sees a colour or thinks of a colour, certain reactions take place in the mind. However, the effects of such reactions and the possibility of consistencies between people are much more debatable.

Depending on the age of children, different colours are considered stimulating; younger children prefer bright colours and patterns while adolescents prefer more subdued colours (Engelbrecht, 2003). However, Pile (1997) suggests strong, warm colours for young children, and warns against the use of intense primary colours. Different preferences for particular colours have been found between males and females (Rosenstein, 1985; Read et al., 1999; Khouw, 1995) with Radeloff (1990) suggesting that males prefer bright colours while females prefer soft colours. Yet, conversely, Ou et al. (2004) argue there is no difference in colour preference between males and females. However, Sundstrom (1986) points out that those experiments that determine people’s colour preferences generally involve small patches of colour that are viewed for a short period. He argues that the findings do not show what colours people prefer their offices (or their classrooms!) to be painted. Yet there are some suggestions that the colour of surroundings might have a distinct impact on mood and behaviour, perhaps sometimes, Sundstrom (1987) suggests, through changing perceptions of room temperature or size. Read et al. (1999) consider that both colour and ceiling height affects children’s cooperative behaviour. Engelbrecht argues that the colour of walls in the classroom affects productivity and accuracy while Brubaker (1998) argues that cool colours permit concentration. Bross & Jackson (1981)
carried out a study on girls in grades 7-9 which found that the participants made fewer errors when working in cubicles painted in their preferred colour, while time to complete tasks changed minimally. **Hamid & Newport (1989)** carried out a study with pre-school children and concluded that the children demonstrated more physical strength and positive mood in a pink-coloured room than in a blue-coloured room. However, the results obtained from this study contrast with the effect that pink is supposed to have on adults (Schauss, 1985). Schauss argues that pink is a tranquilising colour that saps energy and so may be used to prevent individuals from becoming aggressive. Russell and Snodgrass (1987), note the use of ‘a shade of hot pink’ in several American detention centres, based on this belief. In relation to education facilities, Maxwell (2000) found that children thought colour was important and that they thought the colour of the walls in their school was uninviting and boring. However, in this study Maxwell also found that teachers and parents were not concerned by the colour of the walls. **Burke and Grosvenor (2003)** further emphasize children’s preference for colour. In their book The School I’d Like, many children mentioned colours and lots of colours. One 15-year-old student described her school as ‘a giant magnolia prison’ and said, ‘I want colours’. A common complaint in the classroom is eye fatigue and in order to relieve it, research suggests that the end wall of the classroom behind the teacher should be a different colour from the other walls. This idea is also offered by **Pile (1997) and Brubaker (1998)**, with the other walls being a neutral colour. To conclude, however, it might be sensible to bear in mind the comment made by **Sundstrom (1987)** about colour in the workplace: ‘Color is one of the least studied aspects of the physical environment, but it nevertheless remains the topic of some of the most optimistic claims about morale and efficiency’. The selection of color and the reflectance values of finish materials must be considered for all classrooms. Painted surfaces should be a light color, and should have a durable finish to allow washing. A soft matte finish marks easily, is difficult to clean, and, therefore, should be avoided. Special care must be given to rooms where televised instructional activities will originate. Light blue and gray are good choices for these areas. In addition, all finishes should be non-glare. The
reflectance value of paints, viny coverings, laminates, and other finish materials should be selected to enhance ambient illumination and the illumination at working surfaces. The following values are recommended by the Engineering Society of North America:

<table>
<thead>
<tr>
<th>Surface</th>
<th>Reflectance Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceilings</td>
<td>80 percent or higher</td>
</tr>
<tr>
<td>Walls</td>
<td>50 to 70 percent</td>
</tr>
<tr>
<td>Floors</td>
<td>20 to 40 percent</td>
</tr>
<tr>
<td>Desktops</td>
<td>25-45 percent</td>
</tr>
</tbody>
</table>

**Figure 2.9, Surface reflectance values**

In addition to reflectance, work surfaces should have a matte finish. Reflectance values can be found in selection charts and samples. A person's eyes move toward the brightest object in its field of vision. Thus, lighting should highlight what is most important to see--the task at hand. The desk surface should contrast from the paper, book, or computer screen where the task is performed.

**2.2.12 DOORS**

All classroom and lecture hall doors should be a minimum of three feet wide and should have a vision panel in order to prevent injury when being opened. Vision panels should contain shatter-resistant glass that is tinted to reduce light transmission. The area of the glass should not exceed 100 square inches. The base of the vision panel should be no higher than 42 inches above the floor, and the top of the vision panel should extend at least 62 inches above the floor. All classroom doors should have levers (not knobs) for easier use by people with disabilities. The doors should be equipped with hardware that results in a slow and quiet closure to a tight sound seal when fully closed. To facilitate traffic flow, the doors should be capable of standing open during the change of classes. All exits from classrooms and lecture halls should conform to prevailing codes regarding panic hardware for use in case of emergencies. Door opening force, hardware, width, thresholds, and maneuvering clearance should conform to ADA standards. If locks are installed in the
doors; they should be deadbolt locks which are card-activated, not push button. Doors should not contain ventilation louvers because they permit transmission of sound and fumes. Kick plates installed on the egress side of doors will protect them from bumps and scratches. Doors should be located to minimize congestion problems in the hallway when classes are changing. When possible, doors should be recessed into the room so that the door does not swing into the hallway. If it is necessary for the door to open into the hallway, some kind of visual identification (such as the tile pattern in the floor) can be used to indicate the amount of space that the door will occupy when it swings open. Doors should not swing into the primary flow of traffic. This will minimize the danger of someone in the hallway walking into the leading edge of the door. At least one set of entry doors to every facility should be power activated using both a high (approximately 42" above finished floor) and a low (approximately 6" above finished floor) for persons with limited upper body mobility. In some cases, interior doors may also need to be power activated if the door opening pressure is great (higher than 8.5 lbs. force). In many cases, door closures can be adjusted to decrease the door opening pressure. Installation of magnetic devices that hold interior doors open and are connected to a building fire alarm system is another method of providing accessibility.

2.2.13 Student Seating and Work Surfaces
The University and educational environments have conducted several surveys of students, faculty, and staff to determine what types of seating and work surfaces are preferred. Hundreds of furnishings samples have been evaluated in meetings with students and other clients, designers, facilities maintenance staff, and other interested groups. While opinions vary on the merits of specific models, wide consensus has been reached on the following major design decisions:

- Classrooms seating up to 48 students shall be designed with individual desks or tables and movable chairs for each student. This gives instructors the flexibility to break classes down into small groups and then quickly move furnishings back into a traditional layout that faces markerboards and screens.

- Classrooms seating more than 48 students and auditoriums with 200-399 seats shall be designed with continuous fixed work surfaces, tiered floors, and upholstered
movable chairs with adjustable-height seats and backs. Comfortable auditorium-style seats with Tablet-arms can be used in larger auditoriums to reduce room depth and costs.

**Individual desks facing front**

**Individual desks in study groups**

![Individual desks in the classroom](image)

**Figure NO2.10, Individual desks in the classroom**

**Typical Floor Plan**

![Typical Floor Plan](image)
Projects involving rehabilitation of existing learning rooms often have design restraints not found in new construction. For example:

- The shape and orientation of the room or location of entrances may not be ideal
- The instructor area may be too wide, too narrow, or not deep enough
- Existing tiered floors may not allow seat spacing guidance to be met
- Seating capacity must be reduced significantly to meet current design guidance

We expect our consultants to find creative design solutions to these challenges. For example:

- The instruction wall in one 130-seat room was moved and a new tiered floor was built.
- The similar 130-seat classroom below was created in a space formerly used for offices.

Seminar rooms shall normally be programmed and designed to accommodate at least students and an instructor, with seats and tables arranged so that everyone can easily see each other as well as projected images. This requires wider, deeper rooms and more space than conventional conference or seminar rooms typically have. The conceptual design illustrated below provides:

- 20 student seats within the viewing angle of the projection screen.
- Two additional seats to allow greater flexibility in scheduling classes.
- Movable tables/chairs that can be arranged in small groups or facing the screen.
- A movable cart for a document camera and other audio-visual components.
- Movable corner tables for the instructor or two students.

**Work surfaces** shall provide about four square feet of usable space for each student in one unobstructed area, excluding space used for computer monitors, keyboards, mouse pads, microphones, or other types of equipment.

Typical solutions:

- Student desks with work surfaces 20 inches deep and 28 inches wide.
- Continuous work surfaces 18 inches deep and 28 to 30 inches wide.
• Seminar tables with similar space for each student (avoid corner seats sharing space).
• Computer workstations with comparable amounts of usable work space.

Larger work surfaces will only be considered based on academic needs - such as the use of large drawings or maps in class. Smaller work surfaces shall be considered only for large auditoriums (over 300 seats) with auditorium-style seats that have tablet arms.

Student desks, continuous work surfaces, seminar tables, and computer workstations shall be designed to accommodate right and left-handed students as well as students in wheelchairs.

This requires careful consideration of work surface height and where they are located in the room. Provide unobstructed knee clearance space underneath work surfaces that is at least:
• 22 inches wide
• 27 inches high

In large rooms with built-in seats (such as auditorium-style seats with tablet arms), provide 36-inch wide accessible workstations for students in wheelchairs as follows:
• 4 workstations Rooms with 49 to 300 seats
• 6 workstations Rooms with 301 to 500 seats

For each accessible workstation, provide the same number of movable task chairs with the design features described below to accommodate students who are very large or small. Student seats shall be comfortable and provide good ergonomics, with seats and backrests that have an articulating movement.
• Armrests are not desired in most learning rooms because they increase costs, make access more difficult, and are often hard or impossible to adjust to student size variations.

However, they are preferred in rooms used by professional-level non-traditional students.
• In seminar rooms, classrooms and auditoriums with continuous work surfaces, and computer instruction labs, provide armless task chairs for students with adjustable cushioned and upholstered seats and backrests, back tension that adjusts
automatically to weight, and casters (or steel glides). Select fabric that is easily cleaned and provides good abrasion resistance (minimum 200,000 double rubs).

In classrooms and instruction labs where chemicals or art supplies are used, provide movable chairs or stools that do not need foam pads and upholstery to provide adequate comfort. However, chairs should have adjustable-height seats and backs, back tension that adjusts automatically to weight and casters (or steel glides). The specific furnishings models and colors selected for each project shall be consistent with earlier selections on each campus to the maximum extent feasible. This will reduce both initial and maintenance costs. It will also allow furnishings to be moved from room to room or even between buildings as needs change or rooms are renovated, without adversely impacting the appearance of the campus (design guidance, 2003).

When determining the seating capacity of a room (regardless of which type of student furniture is used) additional square footage must be allowed for the instructor area including enough space so that the first row of seats is far enough from the screen(s) for good viewing. In addition, the shape of the room is critical. If a room is narrow, then the instructor area will not require as much square footage as if a room is wide. The locations of doors and aisles also affect the amount of space available for seating. In addition, the “station factor” of the proposed seating can vary depending based on the type of seating selected and whether it’s installed in a small room or a large room. Large rooms benefit from economies of scale. For these reasons, the traditional formula used for figuring room capacities (total square footage minus instructor area divided by station factor) should be considered an estimate and must be confirmed by doing actual furniture layouts. To estimate the number of student stations in a room, take the total square footage of the room, subtract the square footage for the teaching station, and then divide by the number of square feet per type of seating (i.e., movable seating, tables and chairs, or fixed seating).

2.2.13.1 Movable Seating

Classrooms under 50 capacities should have movable seating unless there are special considerations. The University has a standard tablet arm chair (see UM Classroom Furniture Standards). The standard chair has a sufficiently large writing surface that is
suitable for both right- or left-handed students. In special circumstances, tables and chairs are desirable because of the additional work space provided to students. However, this arrangement may reduce the student seating capacity of the room when compared to tablet arm chairs.

2.2.13.2 Fixed Seating

Rooms of 50-75 capacity should be evaluated on the basis of intended use to determine whether fixed or movable seating should be installed. When using fixed seating with a folding tablet arm, allow sufficient aisle space for students to move to the interior of a row while those at the ends have their tablets up. The writing surface on the folding tablet should be at least 150 square inches. Using a variety of seat widths will permit maximizing capacity and accommodating people of various sizes. Wider seats should be located on the aisle.
Continuous Work Surfaces with Movable Chairs:

- Minimum table depth: 18" + 0"
- 36" rows with up to 20 seats:
- 38" rows with 21-24 seats:

Large Auditoriums with Tablet-Arm Seats:

- Minimum clearance: 21" + 19"
- Minimum dimensions: 12" + 21"
- Minimum O.C: 24" + 31"

Figure 2.12, Recommended seat spacing
2.2.13.3 Seating for Left-Handed Persons
Both movable and fixed seating should contain a minimum of ten percent left-handed tablet arms or should contain chairs designed to be used by either right- or left-handed people. The left-handed seats in fixed seating arrangements should be along the left side of the aisle when viewed from the instructor area.

2.2.13.4 Seating for Persons with Mobility Impairments
Stations for students with mobility impairments, especially persons who use wheelchairs, should be provided at approximately four percent of the capacity of the room. In addition, one percent (at least one seat of all fixed seats in rooms of less than 100 capacities) should be aisle seats with no armrests on the aisle side. These stations should be available in a variety of locations within the seating area. To accommodate students using wheelchairs, a table that provides knee space of at least 27 inches high, 30 inches wide, and 19 inches deep should be provided. Another option would be to provide adjustable height tables that adjust from 28 inches to 34 inches above the finished floor. In addition, provisions may be necessary to accommodate companions who assist students with hearing, sight, and mobility impairment.

2.2.14 WINDOWS
If used, windows should be placed away from walls that are near parking lots, exhaust fans, vehicular and pedestrian walkways, and building cooling towers. Many factors, including anticipated types of instructional activities and projected use of audiovisual materials, should be considered to determine whether to include windows in new construction and where to place them when used. The two primary purposes of classroom windows are aesthetic and environmental. The presence of windows in a room provides visual contact and sensory stimulation with the world outside. All windows in classrooms should be operable so that they can be opened to provide additional air circulation when needed, particularly when the building heating, ventilating and air conditioning system is not operating adequately. Windows should either rise and lower or open outward (never inward).

Windowless classrooms may be desirable in special circumstances. Advantages include the ease of light control, the elimination of heat loss or gain during periods of extreme temperatures, and the elimination of noise interferences from traffic or other
exterior sources. Architectural design often requires windows on the exterior of a building. If windows in classrooms are a problem, this requirement can be met by locating windows in other spaces (lobbies, hallways, offices, etc.). Any classroom that does not have windows must be air-conditioned and must contain adequate circulation and outside air exchange. In addition, if there are no windows, extra care must be given to ceiling height and the use of interior finishes, colors, and decor to provide visual interest to the room. When windows are installed, particularly on the south side of the building, install tinted glass with a "low E" rating to reduce the heat transfer from the outside to the inside of the room. Double or even triple, glazed windows will assist in reducing heat transfer and will provide a noise insulation barrier from exterior sounds.

When windows are a desired feature in classroom design, the glass surface should be limited to minimum amounts. All window surfaces should be at the side of the room and not located in the front or rear of the room. The use of clerestory and other types of window panels that admit incidental light can present problems with light control.

**WINDOW TREATMENTS**

Window treatments should be opaque and should be capable of eliminating all outside light from reaching the projection screen(s) and must be robust enough to resist the abuse of daily use. In general, the University installs horizontal blinds on classroom windows. The blinds should be installed so that they cover the window opening as completely as possible. If horizontal blinds do not provide adequate light blocking, some other type of treatment, such as shades or roller blinds may be needed.

**2.2.15 RESTROOMS**

Restrooms should be located on each floor, and the capacity of the restrooms should be calculated according to the number of students in the area during class change time rather than to the capacity of the classrooms. To prevent noise transmission, in no case should there be a common wall or ceiling between any classroom and the restrooms. In new construction, each public and common use toilet room shall be accessible to persons with disabilities. Lecture halls often are used for a variety of activities in the evening which means that access to restrooms is needed. Restrooms should be so located in the building that they can remain open in the evening, even if
the remainder of the building is closed. Projectors are often available to take to classrooms.

2.2.16 CEILING

Clear space is needed above the ceiling, away from mechanical and utility systems to permit installation of screens and structural supports for projection equipment installation. In general, classroom under 75 seats should have flat floors, in both the seating area and the instructor area. Flat floors in the seating area provide greater flexibility when classroom activities involve collaborative learning projects or small group discussions. Raised platforms at the front present ADA access problems, can be a safety hazard, and are not needed in a well-designed room.

Sound must be loud enough to be heard by people sitting in the rear of the room as well as those in the front. The ceiling is the most critical element inside the room in assuring effective distribution and appropriate volume of sound throughout the room. The ceiling should act as a sound mirror, reflecting sound downward to blend with the direct sound. This is why the ceiling should include significant amounts of hard surfaced material. Too many classrooms and lecture halls have ceilings composed entirely of sound absorbing acoustical tile that offer little or no sound reflection. This leads to a significant and undesirable difference in volume and distribution of sound within the room. The surface of the ceiling must be designed to accommodate the required acoustical properties of the room. The area of the ceiling that should be covered with acoustical tile is related to ceiling height.

Table No.2.3, Ceiling heights

<table>
<thead>
<tr>
<th>Room Capacity</th>
<th>Optimum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-49 stations</td>
<td>12 feet clearance</td>
<td>8 feet</td>
</tr>
<tr>
<td>50-75 stations</td>
<td>12 feet clearance</td>
<td>10 feet</td>
</tr>
</tbody>
</table>
Table No.2.4, Ceiling surfaces

<table>
<thead>
<tr>
<th>Ceiling Height</th>
<th>Proportion of Acoustic Tile</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 feet clearance</td>
<td>40 to 50 percent</td>
</tr>
<tr>
<td>10 feet clearance</td>
<td>50 to 60 percent</td>
</tr>
<tr>
<td>12 feet clearance</td>
<td>50 to 60 percent</td>
</tr>
</tbody>
</table>

These numbers presume the use of Noise Reduction Coefficient (NRC) .55–.65 tile in a ceiling suspension system. The acoustical tile should be arranged in horseshoe configuration around the perimeter of the room, with the opening at the front and the rest of the ceiling a hard material such as gypsum board or plaster.

Reverberation in smaller classrooms is normally not a concern, although it can be critical in larger rooms and lecture halls. If a reverberation problem exists, applying a small amount of acoustical material to the walls in the rear of the room may provide sufficient deadening.

2.2.17 Floors
The floor in the general classroom should be vinyl or rubber tile and should have a smooth surface. Industrial grade, stain resistant carpet is rapidly becoming in classrooms because it provides valuable acoustical properties to the room and because it is increasing durable. If carpet is installed, consideration should be given to its effect on the acoustics in the room. Where movable seating is to be used, acoustical advantages of carpet should be weighed against the maintenance costs produced by the wear and tear resulting from the moving furniture. The floor covering should be a medium to light color and should contain some kind of subdued pattern or fleck to break the monotony and to make it less likely to show dirt and stains. A four-inch cove base should be installed around all of the walls.

2.2.18 Hallways
The design of buildings that contain classrooms should recognize that students will be in the hallways or public areas while classes are in session. This means that built-in or permanently affixed seating should be provided. If there are no seats, students will sit on the floor, interrupting traffic flow through the hallways. The lower portion of the hallway walls should have a very durable surface because of normal wear and tear.
Sound-absorbent material may be applied to the upper portion of hallways to provide for control of sound in these public areas. Any changes in floor elevation in a hallway should make provisions for wheelchair and equipment passage through the use of a ramp. Gently sloped ramps (1:20 or less in slope) are typically easier for persons with disabilities to negotiate than steeper, although more direct routes. Ramps must not exceed one foot rise in twelve feet of run and handrails are required if the run exceeds 72" or rise exceeds 6". Level landings are required every 30' of run and wherever a ramp changes direction. See APPENDIX B for a more complete discussion of accessibility requirements. The floors of hallways should be smooth to minimize noise and to facilitate the movement of equipment carts and wheelchairs. Floors also should have a nonskid surface, especially near the outside entrances. To improve acoustics and create visual interest, a variety of materials and colors should be used in hallways and other public areas. Trash and recycling receptacles should be available near the door of each classroom. Receptacles should have a large opening and be large enough to accommodate trash generated between scheduled collection times. It is recommended that a pencil sharpener be conveniently located in or near each classroom and be securely mounted with tamper-resistant screws.

2.2.19 Walls

Walls in classrooms and lecture halls should have a minimum sound transmission class (STC) rating of 50. All walls must extend to the floor above or to the roof construction, and not stop at the ceiling. This will reduce noise transmission as well as improve security. Higher STC ratings and special wall-construction details must be included whenever classrooms must be located adjacent to, above, or below restrooms, mechanical rooms, elevator shafts, athletic facilities, or other sources of high noise levels or where the classroom function generates a significant amount of noise, such as a music room. Concrete masonry units may be used as structural walls, but may have to be covered with another finish in order to provide proper acoustics. Folding walls should not be used in classrooms because it is difficult for a folding-wall to maintain adequate sound separation between classrooms over an extended period of time.
2.2.20 FURNISHINGS AND EQUIPMENT
All furnishings and equipment should be provided by established manufacturers who can provide parts and service for the anticipated life of the items. For long-life items, such as seating, neutral colors should be used so that they don’t look outdated before they are due to be replaced.

**Instructor Area**
A sturdy table or desk should be placed at the front of the room as part of the instructor area. This area also should include either a tabletop or free-standing floor podium with a minimum surface of 18 x 24 inches. For universal access, use a height-adjustable podium or a combination of table and podium. There should be a stool or chair available for the instructor. The instructor furniture should be coordinated with other furniture in the room.

2.2.21 LIGHTING
One important requirement for successful life-long learning is the right educational environment: a university or school which recognizes talent and ability, encourages active and independent learning, makes education an enjoyable experience and motivates both students and staff.

Motivation and a sense of wellbeing, architecture and lighting, good visual conditions and efficient learning - these things are closely connected; as the solutions presented as examples in this booklet will show. Many educational environments and establishments today consist of large complexes of buildings with lots of special classrooms, events and sports halls, cafeterias and refectories, administrative offices and conference zones. Schools, in particular, meet this description because a growing number of them now spread classes throughout the day.

Every room in a university or school or educational establishment serves a particular purpose, for which there are special architectural solutions with special lighting requirements.

For any room in a new or refurbished building, the aim should be to find the best way of harnessing natural daylight and the requisite artificial lighting. Here, however, the importance of artificial lighting is often underestimated, although it plays a major role in most classrooms. In winter especially, the available daylight is generally not
adequate. For media work with projectors, windows need to be darkened. And for scientific experiments, a special lighting situation is frequently necessary.

However, planning artificial lighting involves more than just ensuring adequate brightness in a room. A differentiated lighting design incorporating various separately controlled luminaries systems permits the creation of lighting scenes tailored to requirements. With dimmable room lighting, separate wall washers at the front of the room and additional luminaries at the entrance and perimeter, it is also possible to stage multimedia presentations, lectures and exhibitions with lighting fine-tuned for suitability and safety.

Today, economical operation of lighting systems is assured by energy-efficient lamps and operating gear, high-grade luminaries with high light output ratios as well as lighting control systems which automatically adjust the brightness of lamps to suit the daylight component available and deactivate lighting when a room is not used. Modernizing lighting systems when premises are refurbished can reduce the annual lighting costs of old school buildings or other educational establishments by more than 60%. But lighting design must always focus primarily on human beings, the activities they perform in the room in question and the visual tasks they need to address. What kind of lighting is needed? How much light is right? And what kind of lighting system is required to provide it? Lessons conducted from the front of the class call for different lighting than group work, presentation area lighting has to cater to different needs than play area lighting, and reading and writing have different lighting requirements than tasks performed at computers or machines. On the following pages, we look at the types of room most commonly encountered in schools and educational environments and present model solutions for them and photographs showing theory put into practice. These are not a substitute, however, for individual lighting planning (Information on Lighting Applications, 2000).
STANDARD LIGHT FOR CLASSROOM

Figure No.2.13, Artificial and Natural lights
Due to the increased use of media and technology in classrooms, the design of easy to use, adjustable lighting systems is more important than ever. Lighting should be designed in accordance with the Illuminating Engineering Society's and the National Electrical Code's current recommendations. In addition, lighting should be designed to meet the special program requirements for each instructional space. For example, the control of light has become increasingly important as more technology is used in classrooms. Although adequate lighting levels can be achieved through a variety of approaches, it is essential that all instructional spaces have a range of lighting possibilities, from a comfortable level for reading and seeing the chalkboard to sufficient darkening at the projection screen to accommodate various types of projection while still permitting enough light in the seating area for note taking. Although low light levels are often acknowledged as a problem, too much lighting also can create difficulties (e.g. glare, reflection, eye strain, etc.).

When lighting is reduced during projection, some type of lighting may be needed in the presentation area for the instructor (such as podium light) but care should be taken to insure that the light does not spill onto the projection screen. Special lighting on technology controls or equipment racks also may be needed as well as provision for lighting a sign language interpreter for hearing-impaired students.

Attention should be paid to the maintenance of the lighting system. If bulbs burn out frequently and are not replaced the system won’t work as required. Therefore, all other things being equal, fluorescent lights are generally preferable to incandescent because they last longer. In any case, bulbs should be easily accessible for replacement when they do burn out. Because lecture halls often have high ceilings, the design of the ceiling lighting should recognize the need to regularly change bulbs. Bulb changing is often difficult in a facility that may be heavily used and that may require special equipment to reach the high ceilings, so lighting designs should attempt to ensure along lifetime of the bulbs.

2.2.21.1 General Room Lighting

For general room lighting, a level of 50-60 foot-candles should be provided at all student stations within the room and at the instructor area. General lighting should be uniformly distributed throughout the room, with no noticeable pooling or hot spots.
This general room lighting should be provided using fluorescent fixtures that are banked or zoned to provide appropriate control. In rooms with very high ceilings, care needs to be taken to insure that lighting from fluorescent fixtures does not spread out too much and wash out the projection screen. Generally, 2' x 2' fixtures are preferable to 2' x 4' fixtures, especially in small and medium size rooms, because they make it easier to get even light levels, to allow for separate light zones and control, and to accommodate all the other items that must fit into the ceiling grid (e.g., sprinklers, projectors, speakers, microphones, ducts, etc.). Diffusers in light fixtures should be no reflective.

2.2.21.2 Controls
Room lights should conveniently be controlled from the teaching area, along with any lights that are capable of being dimmed during projection, as well as chalkboard lights. The number of switches required to control the lighting should be kept to a minimum and should be clearly labeled. As much as possible, how to control the lights should be readily apparent to anyone unfamiliar with the room. Standardization of lighting controls among instructional spaces is recommended. In addition, illuminated switches make it easier for users to locate lighting controls in a darkened room.

Switches for turning the general room lights on and off should be provided at every entrance to the room. In rooms with more sophisticated audiovisual equipment installed, such as lecture halls, a lighting control system may be used that interfaces with the room's media control system. In these instances, preset scenes shall be programmed to accommodate various media.

2.2.21.3 Specialized Lighting
For rooms where video recording or distance learning systems may be used, careful attention must be paid to the design of the lighting system. Lighting levels may need to be enhanced for quality television imaging and lighting must be controlled to ensure that projected images are not washed out by the room lights, that direct view monitors don’t produce glare, and that the instructor area has sufficient, even lighting.
2.2.21.4 Ambient Light
Ambient light within the room (from hallways, signage, and other sources) should be controlled so that it is far away from the projection screen and is not a visual distraction. Emergency exit lighting should be self-luminous on a dark background and should conform to code requirements.

2.2.21.5 Emergency and Aisle Lighting
Emergency lighting and exit signs should conform to local codes and be self-illuminating. These should be located so they do not interfere with the image on the projection screens (they should pass the shadow test) or provide visual distraction to the audience. Emergency lighting should be wired so it only comes on in emergencies, even if it uses fixtures that are controlled as part of the normal room lights.

Three common methods of providing egress or aisle lighting include: 1) using small thintubes or strips at the edge of the aisles and steps (such as used in airplanes and movie theaters), 2) using fixtures that are incorporated as part of the fixed seating that is next to the aisle, or 3) narrow beam spots that are mounted in the ceiling and shine down onto the aisle.

2.2.21.6 Wall Lighting
Lecture halls often have high walls and it may be desirable for aesthetic or other reasons to have some type of wall fixtures that illuminate the walls. Fixtures that project light down are preferred over those that bounce light up so that it reflects off the ceiling. Wall lights should be dimmed along with the lights over the seating area. Any wall lighting that disperses light so that it has an adverse effect on projection must be able to be turned off during projection.

2.2.21.7 ELECTRICAL, TELECOMMUNICATION, & AUDIOVISUAL SERVICES
Because technology needs change rapidly, hem designers, designing the educational environments attention should be given to installing cable management systems (conduits, cable trays, etc.) that are flexible and have spare capacity for future growth. This will make it easy to upgrade and expand wiring without the need for major renovation.
Electrical

All electrical services should be protected from surges and spikes. Electrical outlets should not be controlled from a wall switch that could be confused for a light switch. In both new construction and renovations, provision should be made for a minimum of percent, with a recommended 40 percent, future increase in the need for electrical services in classrooms. This includes additional capacity in the breaker box for future use. Wall outlets should be mounted 18-24 inches above the floor. In rooms where student furniture will be wired, it may be advisable to install raceway around the perimeter of the room or outlets in floor boxes to allow easy installation. In cases where extensive technology installation is anticipated for each student station, consideration should be given to using a low-profile raised floor. This will make it easier to make upgrades or reconfigure the room. Even if technology is not installed when a room is built or renovated, electrical service should be provided in appropriate locations to allow for easy installation in the future--the ceiling for future projection, camera, and wireless communication capability. Specifically, each projector location will need a separate, dedicated circuit in the ceiling. Each potential camera location needs a duplex outlet near the ceiling. If electric screens are being installed, electrical service to the screen locations is required. Each equipment rack location needs a separate dedicated circuit.

If there’s an AV closet, in addition to the separate circuit for the rack, at least one convenience duplex outlet is needed near the door. Electrical outlets should be provided in the front of the room for convenient connection of overhead projectors and other equipment. There should be no elevator motors, compressor motors, blower motors, or other types of equipment on the side of the power transformer that feeds classroom or lecture hall circuits.

2.2.21.8 Security

Classrooms that house equipment are designed to provide for maximum security and at the same time to be convenient to access by the user. Security measures include marking equipment (both externally and internally), using security cables and devices, and installing equipment in racks using University-standard security screws and rack
doors. AV closets and projection booth have standard door locks that use key cards. Portable equipment is attached to carts and kept in secure storage closets.

2.2.22 Chalkboards/Marker boards

All general-purpose classrooms should have chalkboards (or in special cases, marker boards) across as much of the instructor area wall as possible. The installation of boards on the side or rear walls should be determined by the programs that will use the room and the viewing angles of the students. The boards should be mounted with the bottom edge of the tray 36 inches above the finished floor. The boards should be four feet in height and have trays under the full width of the board. Seams on the chalkboards/marker boards should be flush. The surface of the chalkboard should be black to provide maximum contrast. In specialized situations, such as lecture halls, motorized board systems may be appropriate. While marker boards eliminate chalk dust, markers are more expensive and only those made for marker boards should be used since others can permanently damage the marker board surface. Marker boards will only be installed in special circumstances when the primary users of the room agree to supply markers. In addition, marker boards should not be used as projection screens. Currently, projection screens are being installed off-center (sometimes two screens are installed) so that the chalkboard can be used at the same time as material is being projected. This requires that the chalkboard be illuminated without any light spilling onto the projection screen. Illumination of the chalkboard or marker board should be 10-15 lumens distributed uniformly across the entire writing surface. The lights over the writing surface should be controlled in separate sections to permit illumination of a portion of the board while one projection screen is in use. Proper selection and installation of the board lighting and/or baffles should ensure that the lamps in the fixtures will not be visible to students seated in the front rows. In addition, the fixtures should not interfere with raising/lowering the screen(s). Board lighting should not cast any light on the projection screens. Whenever possible, this should be achieved by placing the lighting behind the screens (between the screens and the chalkboard) and sitting directly on the top edge of the board. This requires that the lighting have a narrow profile so the screen doesn’t need to be too far forward. In cases where the nature of the screen mounting precludes this, lighting
fixtures should be selected that sufficiently control the spread of the light so that no light spills over onto the adjacent projection screen.

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Depth</th>
<th>Fixed-Height</th>
<th>Adjustable-Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td>Under 30 ft</td>
<td>Min 36 SF (3 x 12 ft)</td>
<td>None</td>
</tr>
<tr>
<td>Classroom Computer Instruction</td>
<td>Under 50 ft</td>
<td>Min 36 SF (3 x 12 ft)</td>
<td>Min 24 SF (3 x 8 ft)</td>
</tr>
<tr>
<td>Larger rooms Distance Learning</td>
<td>Over 50 ft Any depth</td>
<td>Min 24 SF (3 x 8 ft) With electronic capability</td>
<td>None</td>
</tr>
</tbody>
</table>

Figure 2.5 Provide marker boards in classrooms

2.2.23 Video and Computer Projection Systems

Classrooms should be designed to accommodate both video and computer generated (or electronic) displays. In general, the same room conditions specified for optical projection (light control, screens, sound, etc.) apply to video and computer projection. Determination of the most appropriate type of display or projection system to use depends on room and audience size, and the type of visual materials used. For showing video, a large monitor/receiver (27”- 40”) may be adequate in seminar rooms, while large screen projection devices are most suitable for standard size classrooms and lecture halls. For computer images, a video/data projection system is generally more effective regardless of room and audience size. When a monitor/receiver needs to be movable, carefully evaluate equipment for safety considerations. Monitors/receivers mounted on carts tend to be top heavy and can cause serious injury or damage if they are not designed, built, and/or used properly. The International Communications Industries Association (ICIA) has established standards regarding carts used to move portable monitor/receiver equipment to and from classes. It is recommended that these standards be followed. If a monitor/receiver is wall or ceiling mounted, it should be secured and tilted down for easy viewing. If the set is mounted over an aisle, the lowest part of the mount should be at least seven feet from the floor or it can be mounted on a cane-detectable cabinet or rack in the corner. Special attention during installation is needed to avoid glare from lights and windows.
Projection systems for standard classrooms can be portable or ceiling mounted. For optimum results, control of natural and artificial light is critical. Window cover must be opaque. Room light control must be designed so the projected image is not washed out by ambient light, and to allow for note taking 5 to 10 foot-candles over the student area.

Since faculty at the University make heavy use of both video and computer materials in their classes, all projectors are selected for their ability to provide good images for both types of media. Currently, the University uses LCD projectors. The exact projection distance will depend upon the focal length of the projector lens and the image size required.

Several factors should be considered when mounting a video projector in the ceiling. There must be a grid or beam anchored to the permanent ceiling that is strong enough to support the weight of the projector and, if needed, an elevator lift or pulley system to lower and raise the projector or an above-ceiling mounting device. There must be electrical power and conduit/cable tray running from the ceiling location to the teaching station or equipment rack. Equipment manuals should be consulted to determine the appropriate type of ceiling mounts, conduit size, and projection distances required to meet legibility standards.

2.2.24 Computers

The University uses two methods of providing instructor computers in classrooms. For classrooms with installed AV systems, computers are installed in the room’s equipment rack. For those who bring their own laptops, a cable for connecting the laptop is provided. In rooms without installed AV systems, carts with computers and portable.

TELEPHONES

A public telephone should be located in a visible area near the lobby or entrance area of the building. The telephone should be located near lecture halls and installed so that they do not obstruct the normal flow of traffic through the lobby area. The telephone should be accessible to persons with disabilities, equipped with a variable volume-control feature for people who are hearing-impaired and located at an appropriate height for persons who use wheelchairs.
SIGNAGE

Signage in and around a classroom should be kept to a minimum and should be coordinated with other signs and with the general decor of the area. All classrooms should have a room identification number on the wall next to the door. These numbers should be accessible to and meaningful to all students in accordance with local code. There should be information located inside and outside each classroom regarding how to report problems with physical facilities and with equipment in the classroom. When movable seating is used, the capacity of the room should be prominently posted within the room. This will assist the staff in maintaining the proper number of seats in the room.

2.2.25 NOISE

Noise affects a majority of students by encumbering the acquisition of language, reading and memory skills. In addition, Evans and Maxwell suggest that excessive ambient noise caused by ventilation systems, movement of furniture on hard surfaces, and passing planes, trains and automobiles also leads to learning difficulties. Chronic noise exposure in particular has been shown to trigger the stress response by stimulating the amygdale (the area in the brain responsible for the fight-or-flight response), thereby increasing the heart rate and blood pressure. This reaction inhibits prefrontal cortex activity (the area responsible for learning) and thus impedes the student’s higher cognitive functioning. To block external sources of noise, such as cars, trucks, trains, airplanes and lawn mowers, schools should be constructed with sound-dampening zones built into walls and ceilings (Evans, 1997). Windows should be double- or triple-paned, and walls should include sound-dampening insulation extending from the floor to the next level without an air gap (i.e., not only to the level of a suspended ceiling). In addition, tall greenery incorporated into the landscape design can help to reduce, though not eliminate, external noise. Internal noise is harder to mitigate because much of it derives from human activity, such as many people speaking at once, the moving of chairs and desks on hard floors and the tapping of pens or pencils against desks. Fidgeting is a significant source of ambient noise within the classroom, particularly when the hard surface of a chair or desk is in direct contact with another hard surface, such as floor tile or concrete. Equipment,
too, is a factor. Older lighting fixtures, heaters or air conditioners, along with a variety of electronic devices, such as computers, printers, copiers, mobile phones and pagers, all add to the level of indoor ambient noise. In a study by Enmarker and Boman, students and teachers ranked classroom chatter as the most annoying noise and the scraping of tables and chairs on the floor as the second most annoying (Enmarker, 2005). To reduce noise in the classroom, consider the use of sound-absorbent cladding on low ceilings. Also consider angling the ceiling so that it is lower in the back of the room and higher where the instructor teaches. Other measures include the use of window treatments, as safety permits. Rooms where group activities are more prevalent than lectures could incorporate a low-frequency sound to mask conversations or outside noise. Other sound dampening options include rubber pads applied to the feet of chairs, tables and desks. (Thicker rubber absorbs sound better.) Flooring materials should be comprised of a soft material—such as cork, linoleum or carpeting—to minimize noise caused by foot traffic, dropped objects and the movement of chairs and tables. Also, angling walls at least five degrees out from their original parallel plane can reduce reverberation.

All rooms with capacities greater than 100 shall be equipped with voice implication systems. Voice amplification may be installed in rooms of <100 capacity, based on outside noise factors, the acoustical characteristics of the room, and any special needs. (See APPENDIX A, Designing For Accessibility.)

**Noise Control**

According to below Table for room background noise guidelines, Selection criteria depend on user or space sound quality needs. Higher or lower values might be appropriate and should be based on an analysis of space use, economics, educational environments and user needs. An experienced acoustical consultant should be retained for guidance on acoustical criteria spaces below RC30 and on all performing arts spaces. Verify sound criteria with local codes.

Engineer systems to achieve specified sound levels, and use sound attenuation, as necessary. The noise from cooling towers might require special consideration. Consult local codes for maximum ambient noise. See Table for maximum ambient sound guidelines.
### Table NO.2.6
Maximum ambient sound guideline

<table>
<thead>
<tr>
<th>Space</th>
<th>Noise Criteria (NC)</th>
<th>Room Criteria (RC)</th>
<th>Maximum dbA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical rooms</td>
<td></td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Primary electrical rooms</td>
<td></td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Stairs</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet rooms</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telecom data rooms</td>
<td></td>
<td>30-40</td>
<td></td>
</tr>
<tr>
<td>Elevator machine rooms</td>
<td></td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Laboratory storage spaces</td>
<td></td>
<td>45-55</td>
<td></td>
</tr>
<tr>
<td>Shipping &amp; receiving spaces</td>
<td></td>
<td>45-55</td>
<td></td>
</tr>
<tr>
<td>Breakout rooms</td>
<td></td>
<td>30-40</td>
<td></td>
</tr>
<tr>
<td>Multi-purpose rooms</td>
<td></td>
<td>40-50</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Square Footage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratories</td>
<td>40-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory work spaces</td>
<td>40-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory support spaces</td>
<td>40-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory equipment rooms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private offices</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open-plan offices</td>
<td>30-40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corridors</td>
<td>40-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conference &amp; seminar rooms</td>
<td>25-35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumentation rooms</td>
<td>30-40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classrooms</td>
<td>25-30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large lecture rooms</td>
<td>25-30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gymnasiums &amp; natatoriums</td>
<td>40-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music practice rooms</td>
<td>30-35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Drama theaters | 25 |
Outdoor ambient | 60\(^{1}\)

One of the simplest ways to avoid creating noisy learning rooms is to locate them far enough away from high noise sources such as mechanical equipment, heavy vehicle traffic, music practice rooms, stadiums, or other outdoor spaces that frequently used for noisy activities. Learning rooms shall be designed to provide adequate acoustical separation from all other interior and exterior noise sources.

The use of movable or folding interior partitions should be avoided because it adds significant cost to meet the 50 STC requirements.

Regardless of room size, location, or construction, provides:

- An overall noise level in empty rooms under NC 35

Ensure this noise level will be met with the heating and air conditioning system operating. Wall, ceiling, and floor surfaces shall provide good acoustics. The design of large classrooms (over 50 seats), auditoriums, and distance-learning rooms requires special attention and the services of an acoustical engineer. Provide:

- High-reflectance materials near the instructor that project sound to the back of the room.
- Sound-absorbing materials on ceilings and on the upper levels of walls in the rear.
- Target 0.75 reverberation time (acceptable range, 0.6 to 1.2)

Special design features such as angled walls and ceilings may be required to insure sounds can be clearly heard without distortion in all parts of the room (educational environment design guidance, 2003).

### 2.2.25.1 Insulation from Mechanical System Noise

The mechanical system supporting classrooms should generate a background noise of no more than NC 35. To achieve this, the HVAC system requires careful design, competent installation and balancing, and regular maintenance. Factors that influence the design of a quiet operating system include air handlers or fans located away from

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(1) At 120 feet
the classrooms; low velocity of air within the room; and proper sizing and acoustical
treatment of ducts, returns, and diffusers. Inadequate or improperly sized mechanical
systems often cause acoustical problems for classrooms. Budget constraints and cost-
cutting measures may be short-sighted and create conditions where HVAC systems
must be turned off so that students can hear. This requirement must be communicated
to the design engineer to ensure proper air circulation and duct sizing.

Often, less expensive high velocity, small duct mechanical systems create noise
problems that go undetected until it is too late. Large, oversized ducts create lower
velocity and higher air volume so that air is dispersed quietly over the entire room
rather than blasting out of small vents. If low structural ceiling heights prevent large
duct work, consider raising the ceiling as high as possible and installing mechanical
ducts in the top of the side walls. Side wall duct systems generally limit the distance
cool air can be distributed, however, and are used primarily in smaller classrooms.

In rooms with ceiling mounted video projectors, microphones, or other equipment, the
duct work needs to allow for installation in the proper location.

ACOUSTICS

Good listening conditions (i.e. a quiet room) depend on four basic factors:

- The amount of noise entering the room from outside sources
- The loudness of various sound sources within the room (with or without
  amplification)
- The distribution of sound to all parts of the room
- The fidelity and clarity of the sound (lack of reverberation, distortion, etc.)

Perhaps the single most important factor related to good acoustics is the absence of
noise from external sources since this interferes with sound created within the room.
Even a room with good internal acoustical properties and sound systems can’t
overcome extensive noise infiltration.

2.2.26 Library

Even though reading habits have changed considerably since the advent of electronic
media, books are still an indispensable tool for learning. In schools especially, librar-
ies perform an important function in encouraging enjoyment of reading. The physical
surroundings and the atmosphere of a library play a major contributor role here.
The reading area should be an agreeable place to work, a place where readers feel comfortable. Large windows for adequate daylight are a prerequisite for this. Blinds not only provide a protective screen against direct sunlight; on a cloudy day, they can also direct additional daylight into the room. When planning artificial lighting, the first rule here is to ensure glare- and reflection-free conditions for library users studying papers, reading books or periodicals or simply looking round the room. With direct/indirect lighting, the so-called “cave effect“ is avoided by ensuring an agreeably bright ceiling, and even reading matter printed on glossy paper remains clearly legible. Separately switched desktop lighting permits individual adjustment of workplace luminance and makes for better conditions for writing.

For documentary searches, computers have almost totally superseded traditional card catalogues. So areas with VDU workstations are found in most libraries and need to be ergonomically designed and lit. Desks should be large enough to accommodate books and papers. As for lighting level, care should be taken to ensure a harmonious distribution of brightness, i.e. balanced ratios between luminance at the VDU, on the desktop and in the background. It is imperative that direct and reflected glare should be avoided. So that the required literature can be found, shelving units should be illuminated over their whole area. Special wall washers designed for high vertical luminance provide the kind of lighting that is required. When choosing lamps, attention must be paid to good colour rendering properties. We often look for books which we recognize by the colour and design of the spine. All the aisles in the room and between the rows of shelves should be lit to ensure an agreeable brightness and enable users to get their bearings in the room quickly at any time. Escape routes and exits must always be clearly identifiable. Illuminated or back-lit signs at shelving units and doors are conspicuous and effective at helping users find their way. Separate consultation zones are useful for catering for study teams or tutorial groups wishing to work in the library. Good sound insulation is needed to permit conversation without disturbing library users who are reading. Mobile standard luminaries designed for direct/indirect lighting make for an agreeably bright ceiling and can be repositioned with desks to meet the needs of different sized groups. Nowadays, library searches are conducted on computers; card catalogues have all but disappeared. So lighting needs
to be suitable for VDU use. VDU workplace luminaries designed for good glare suppression and direct/indirect lighting with electronic ballasts and high-grade louvers permit hours of searching without sore eyes. (Information on Lighting Applications, 2000).

### 2.2.27 HEATING VENTILATION AND AIR CONDITIONING

The circulation of air is a critical factor in all instructional spaces. Poor air circulation causes students to feel drowsy and not alert. Careful selection of duct sizes, air handlers, and fan units can achieve effective combinations of proper air flow and quiet operation of mechanical systems in classrooms and lecture halls. The heating, ventilating, and air-conditioning (HVAC) system must provide adequate air changes per hour in conformance with current standards of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). The recirculation of air within the building should not be done in such a way as to result in hall noise entering the room. Air ventilation units should not blow a strong volume of air directly on the seating area or on the instructor area. Since it takes very little air flow to cause projections screens to move, there should be no ducts or intakes close to projection screens. The air circulation system in the room should be able to be used at all times separately from any HVAC system that may be operated only seasonally. In rooms where ceiling micas are installed, careful attention must be paid to insure that air ducts don’t blow directly on mics and produce extraneous noise. The temperature range should be maintained within 68-75 degrees Fahrenheit, with relative humidity at 50 percent, plus or minus 10 percent. No building should be designed so that the windows and doors are essential for temperature control within the building. Ideally, each classroom should have a temperature sensitive monitoring device within it and that device should be tied to a central monitoring system maintained and overseen by Operations and Maintenance staff. Response to abnormalities detected by such a monitoring device should be a number-one priority at all times because of the lack of any other method of circulating air, especially in rooms without windows.

The acoustical considerations in determining volume of air-handling noise should include, in addition to the background noise level, any vibration considerations that would generate additional noise. Air intakes for classrooms should not be located in
or near loading docks, trash receptacles, or areas of high vehicular traffic outside the building. Additionally, air exchanges inside buildings should isolate air circulated in classrooms from air circulated in laboratories and other areas capable of producing odorous or hazardous airborne contaminants. The system servicing classrooms should operate independently of any system(s) servicing other functions within the same building. The installation of low-velocity ceiling fans will provide air circulation, an important element in all classrooms, but especially in rooms that are not air conditioned. The mounting location of the ceiling fans must not interfere with projected images or equipment. Technology can make special demands on the buildings in which it is installed. For this reason, new construction (as well as renovation projects) requires special attention to the design of the electrical and the heating, ventilation, and cooling (HVAC) systems so they will meet the requirements of the equipment that will be installed. This often means specially conditioned or additional electrical circuits, increased number of air exchanges, year-round temperature and humidity control, low-noise ducts and air returns, etc. Renovation of individual rooms can present special challenges, especially when building mechanical systems are not being replaced. In those circumstances, even such simple measures as installing ceiling fans can improve conditions until major renovations can be made. Routine maintenance of building mechanical, electrical, and plumbing systems is critical. It is particularly important for the HVAC system ducts to be cleaned and the air flow balanced regularly. These measures not only benefit the users, but they prolong equipment life and reduce maintenance costs since many types of equipment are especially sensitive to environmental conditions.

2.2.28 VENDING AREAS
Vending machines should not be located in the lobby area outside a lecture hall. Vending areas should be placed in remote locations away from classrooms, preferably in an alcove or other similar location that will minimize congestion and noise when students use the machines. The vending area should have trash/recycling containers in the immediate area of the vending machines. Any trash/recycling containers in the lobby area should complement the interior decor of the lobby area.
2.2.29 Distance Learning Classrooms

The definition of “distance learning” is very broad. Distance learning is in a state of continuous change due to advances in the technology used to transmit information. This guidance focuses specifically on the design of facilities used for transmitting and receiving real-time interactions and the exchange of information to and from remote sites. The design goal is to make the technology invisible and the sharing of images and information between sites as seamless as possible.

A classroom, seminar room or auditorium may serve as a distance learning room. Distance learning classrooms have the same purpose as video-conferencing rooms and use similar technologies. The infrastructure required to transmit video images and audio signals shall be evaluated early in the design process to determine its adequacy and the ramifications it will have on room design and the technology used.

It is important to determine the type of media that instructors plan to use and what their expectations are for the students at the remote site. Technologies currently used that make this room type unique are:

• Multiple remote controlled cameras focused on the person(s) speaking
• Multiple “push to talk” microphones located near a student’s seat
• Electronic marker-boards
• Compressed digital transmission of low, medium, or high bandwidth video from point to point or between multiple points.
• Streaming video on the data network
• Full motion satellite or cable video or television transmission

Most of the criteria used in the design of other types of learning rooms apply to the design of distance learning classrooms. Specific criteria for distance learning include:

• Entry from the rear or side of the room is strongly recommended so that people arriving late can find a seat with minimum disruption.
• Work surfaces shall be at least 18 inches deep, but 21 to 24 inches is preferable.

Provide directional microphones between every pair of seats. Power and data outlets for laptop use at each student workstation may also be requested or required.

• An interactive seating layout that encourages students to communicate with each other as well as the instructor, while maintaining good sight lines to projected images,
isessential. Layouts with a gentle arc, semi-circular or U-shape oriented toward screens tend to work best.

- Two rear-projection screens are recommended. One screen would display images of instructors and students located in other distance-learning rooms. The other screen would simultaneously display other digital images. Contact UC audio-visual technology specialist for detailed specifications. Portable, self-contained rear-projection systems are sufficient for seminar rooms and small classrooms.

- In larger rooms, built-in units with the screens set in a partition may be required to meet the minimum screen size criteria described previously.

- Front projection should be avoided because the bright lights required to make the instructor visible on camera wash out the images, and bright projectors cannot makeup for the loss of contrast. Rear projection or luminescent flat panels (such as plasma or LCD) are required. Project budgets must anticipate the higher cost of these projection systems (educational environment design guidance, 2003).

2.2.30 Age and Quality of Educational Environment Facilities

Honeyman and Sayles (1995) clarified that the age of Educational Environments facilities was associated with the level of deterioration of a facility, and a well-constructed, and well-maintained old building in good condition. Honeyman and Sayles (1995) reported that even though proportions of old buildings varied between states to states as well as between university and school districts within the states, almost 30% of all school buildings are approaching the end of their useful life at 50 years; over 50% of the buildings are built before 1960 and are now nearly three quarters through the estimated 50-year useful life of a well-constructed and maintained building. (p. 4) Age of the school was associated with the level of deterioration of a facility, and a well-constructed, well maintained old building in good condition (Honeyman & Sayles, 1995). The NCES (2000) reported that more than one in four schools were built prior to 1950 and the average age of the school buildings was 42 years old. Lyons (2001) contended that environmental nuisances were beginning to appear now in the public and media. Research studies were uncovering evidence that showed these environmental nuisances and other aspects of school facilities had a large negative impact on children’s education. Age is one of the
systemic problems. With the average age of schools being 42 years of age, these schools were facing demands that were never intended or even conceived when these buildings were built (Lyons, 2001). Education today was delivered in an entirely new manner, with new tools, techniques, and teaching methods that increasingly did not fit the simplistic conventions of 42 years old school designs (Lyons). Many of the older schools could not meet the Americans with Disabilities Act (1990) accessibility requirements without extensive and expensive renovations (Lyons, 2001). There were only a few 42-year-old schools that could accommodate a technologically driven working environment (Lyons). McGuffey (1982) claimed that earlier studies correlated student achievement with better building quality, newer school buildings, better thermal comfort, air quality, better lighting, more advance laboratories, and libraries. Researchers found that building age and quality were linked to higher test scores on standardized tests (Chan, 1996; Schneider, 2002); students had better records for health, attendance, and discipline, satisfaction (Burkett, 1987); and student achievement and behavior (Jago & Tanner, 1999).

Chan (1996) noted that school facilities played a significant role in shaping students’ learning process. According to Chan (1996), there had been seven research studies in the past that found a relationship of school building age and student achievement (Burkhead, Fox, & Holland, 1967; Chan, 1979; Chan, 1996; Guthrie, Kleindorfer, Levin & Stout, 1972; McGuffey & Brown, 1978; Michelson, 1970; Plumley, 1978; Thomas, 1962). According to Earthman (2002), the age of the school building had been tested as a factor in relationship to student achievement and student satisfaction. The age of a building in and of itself was usually not an important factor in influencing student performance, but the building components that were necessary for good student learning (e.g., thermal quality and acoustical control) were usually absent in older buildings. If older buildings did have some of the important components, these components would be compromised of poor maintenance or retrofitting practices. Earthman and Lemasters (1996) from a research survey, found that there was a clear conclusion that followed, that older buildings usually did not have the main attributes of a modern building that were associated with a positive physical environment conducive to student learning.
2.3 EDUCATIONAL SATISFACTION

Satisfaction is a well-researched topic in both academic and non-academic (workplace) settings. In academic settings, students’ satisfaction data helps colleges and universities make their curriculum more responsive to the needs of a changing marketplace (Eyck, Tews & Ballester, 2009; Witowski, 2008). Student satisfaction is an important part of the effort to successfully market higher education. Satisfaction in this study means overall positive feelings of college and university students and teachers toward their present occupying job in the certain areas in this study.

Student’ satisfaction is defined by Wiers-Jenssen, Stensaker and Grogaard (2002: 185) as students’” assessments of the services provided by universities and colleges. Student satisfaction is a continually changing construct in the Higher Education environment due to repeated interactions (Elliott and Shin 2002). It is a dynamic process that requires clear and effective action as a result of an institution listening to its students. Student satisfaction is a complex construct influenced by a variety of characteristics of students and institutions (Thomas and Galambos 2004: p-252).

Academic Satisfaction can be termed as satisfaction that can be obtained from educational environment and performance. When one’s desires get fulfilled, one feels satisfied. That is an overall response not only to the learning experience of a student (Wiers-Jenssen et al. 2002).

Educational institutions are becoming increasingly aware of the importance of quality considerations in delivery of teaching, research programs and service. This is due to the increasing numbers of students entering the education system and government funding increasingly being tied to assessment of the quality of the teaching and research programs at educational institutions (Shago 2005). Recruiting students has always been an important activity for the higher educational institutions. However, the rapid expansion of colleges and universities, significant increases in college education costs combined with demographic shifts in the population may force colleges to think differently about the role of student satisfaction for their survival. Various evaluation methods have been used in many European higher education institutions in order to find out the needs of students and as an attempt to improve the
quality of teaching and learning (Wiers-Jenssen et al. 2002). Continuous improvement of quality is a philosophy. Within this philosophy is a set of broad principles and values that provide guidance on how to restructure and improve organizations (Frasier 1997:7). Continuous quality improvement requires an organization to meet or exceed the customer’s expectation of quality (Frasier 1997:8). Higher education institutions are becoming more business-like. Similar to the importance of satisfying customers to retain them for profit-making institutions, satisfying the admitted students is also important for retention. It might be argued that dissatisfied students may cut back on the number of courses or drop out of college completely. Hence, the satisfaction-intention-retention link for students in higher education should be studied and carefully managed (Kara 2004:1).

In the growing literature on academic quality there is often extensive debate about the meaning of the term (Green 1994). Many have suggested that ‘academic quality’ is amorphous, non-measurable, or so ambiguous in its meaning, deeming it inappropriate for public intervention (Dill 2007). Harvey and Green (1993:2) put forward a number of ways of viewing quality. Firstly, Harvey and Green mention the traditional view that quality is linked to the idea of exceptionally high standards. Secondly, quality is seen as consistency focusing on processes and set specifications that it aims to meet. Thirdly, quality relates to relevance to its purpose while fourthly quality is equated with value for money at the heart of which is the notion of accountability. Fifthly quality is seen as transformative because education is not a service to the customer, but an ongoing process of transformation of the participant. On this follows two notions of transformative quality in education i.e. enhancing and empowering the consumer.

2.3.1 STUDENTS’ SATISFACTION

Explanation of the Concept of College students’ satisfaction

According to Kotler and Clarke (1987) define satisfaction as a state felt by a person who has experience performance or an outcome that fulfill his or her expectation. Satisfaction is a function of relative level of expectations and perceives performance.
Reed et al. (1984) defined college student satisfaction “as the student’s emotional reactions to college” (p. 68). Oliver and DeSarbo (1988) described student satisfaction as a student’s favorable evaluation of the outcomes and experiences associated with their educational experience (Elliott, 2002).

According to Wiers-Jenssen, Stensaker and Grogaard (2002:185) as students’ assessments of the services provided by universities and colleges. These services include the following:

- quality of teaching (academic and pedagogic);
- quality of supervision and feedback from academic staff;
- composition, content and relevant curriculum;
- balance between different forms of organized teaching activities and self-tuition
- quality of support facilities;
- quality of physical infrastructure;
- quality of, and access to leisure activities; and
- Social climate.

The concept of a student satisfaction is derived from the concept of customer satisfaction. Customer satisfaction not only plays an essential role in marketing, but also a critical factor in persuading consumers to make repurchases (Churchill & Surprenant, 1982). However, in conflict with the traditional concept of consumer satisfaction, Oliver & Swan (1989) argued that satisfaction is an emotional factor and there is a significant relation with educational achievement. Thus, satisfaction can be considered as a reflection of life experience: it is a subjective view based on personal experience, individual beliefs and relationships. Parasuraman, Zeithaml and Berry (1990) proposed that the concept of satisfaction could be equated to the gap between real-life experiences and expectations. However, all the concepts mentioned above are from a business operation viewpoint to discuss customer satisfaction. Stone and Thomson (1987) indicated that the notion and the contents of customer satisfaction should be modified for educational application. It should include constitutional amendments, administrative policies, educational goals and educational processes.
Student satisfaction is one of a number of factors that contribute to student success and retention. Student success has been defined as a blending of personal development, persistence, learning, and satisfaction (Kuh et al., 2005). Student satisfaction can be defined as the extent to which a student’s perceived educational experience meets or exceeds his or her expectations, measured as gaps between students’ expectations and perceived reality (Juillerat, 1995). Students are satisfied when their perception of reality matches their expectations. Conversely, students whose expectations are greater than their evaluation of reality are most likely dissatisfied. Students who are not satisfied often become disengaged and will likely not persist (Bryant, 2006; Juillerat & Schreiner, 2004).

According to Sloan Consortium defines student satisfaction as, “Students are successful in the learning and are pleased with their experience” (J. C. Moore, 2009). A similar definition is given by Sweeney and Ingram (2001). They define satisfaction as, “the perception of enjoyment and accomplishment in the learning environment.” Both definitions focus on accomplishment and success in learning, and pleasure and enjoyment with the experience.

Thurmond, Wambach, Connors, and Frey (2002) describe student satisfaction as “a concept that reflects outcomes and reciprocity that occur between students and an instructor.” Reporting on satisfaction in a learning environment, Wu, Tennyson, and Hsia (2010) define satisfaction as the sum of student feeling and attitude that results from aggregating all the benefits that a student hopes to receive from blended learning environment system.

Students spend considerable time and money, as well as exerting substantial effort in obtaining a quality education and should perceive their post-secondary educational experiences as being of high value (Knox, Lindsay, & Kolb, 1993). Student satisfaction is important because it influences the student’s level of motivation (Chute, Thompson, & Hancock, 1999; Donahue & Wong, 1997), which is an important psychological factor in student success (American Psychological Association, 1997). Meeting and exceeding the students’ expectation not only satisfies students but also lead them to become advocates who provide a free promotion source for the university.
Sinclaire (2011) reported three compelling reasons for interest in student satisfaction. First, the Sloan Consortium’s “Five Pillars of Quality Online Education” declares student satisfaction to be the most important key to continuing learning. It reflects learners’ evaluation of the quality of all aspects of the educational program (Sloan, 2011). And there is evidence that student satisfaction is positively related to retention and a decision to take one or more additional courses (Booker & Rebman, 2005). Lastly, student satisfaction is important because satisfied students represent a public relations asset for a college or university. If students are viewed as customers of college education, their satisfaction is important to recruitment efforts. Therefore, there is a need for more understanding of factors that affect student satisfaction with blended learning.

Tough (1982) defined student satisfaction as the following: student satisfaction refers to the student’s perception or attitude towards the learning activities. Where the student is happy with his/her studies or adopts an aggressive learning attitude, student is deemed to be “satisfied”; where the student is unhappy or adopts negative or passive attitude, student is deemed to be “dissatisfied”. Hence, student satisfaction could be perceived as the student’s positive feelings or attitude towards his/her learning activities. The degree of student satisfaction is as the margin between “level of anticipation” and “actual results”. A smaller margin would mean greater satisfaction and a larger margin would mean lower satisfaction. The mission of education is not only to impact knowledge but also to enhance the student’s total development (Astin, 1993). One of the ways education institutions accomplish this mission is by continuously collecting information on student satisfaction, defined by various authors as an “ever-present campus variable” (Betz, Menne, Starr & Klingensmith, 1971), a key outcome of education (Astin, 1993; Sanders & Chan, 1996), and a “quality enhancement tool designed to improve the quality of the student experience” (Harvey, Plimmer, Moon & Geall, 1997).

Colleges and universities use student satisfaction data to better understand, increasing motivation for studying and teaching, improve and change campus environments, thereby creating settings more conducive for student development. In this sense, student satisfaction is an indicator of the institution’s responsiveness to

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- Balance between different forms of organized teaching activities and self-tuition;
- Quality of support facilities;
- Quality of physical infrastructure;
- Quality of, and access to leisure activities; and
- Social climate.

**Perspectives on Students’ Satisfaction**

The literature on student’s satisfaction and their perception of the educational environment is very complex. Views of the authors on the concept of student’s satisfaction are quite diverse. Each author has their own perspective regarding the needs of students in the university. Some authors support the so called “managerial dimension” of student’s satisfaction: the university is an enterprise and the students are the customers. Therefore in order to satisfy students, the customer approach should be applied in the universities.

The most controversial point of view is that of students being a customer of the university, due to the fact that universities are becoming more business-like. For example Elliott and Shin (2002) mean that globalized competition has stressed the strategic importance of satisfaction and quality in the battle for winning consumer preferences and maintaining sustainable competitive advantages. Hill (1995) suggests that the primary customers of the universities are the students, and so Higher Education is increasingly recognizing that it is a service industry and is placing greater emphasis on meeting the expectations and needs of students. Moreover, focusing on student satisfaction not only enables universities to re-engineer their organizations to adapt to student needs, but also allows them to develop a system for
continuous monitoring of how effectively they meet or exceed student needs (Elliott and Shin 2002). Furthermore, researchers argue “that relationships are important and that the overall market orientation of organizations needs to be translated to a relationship level in order to be effective” (Helfert et al. 2002).

According to Seymour (1972), developing many happy satisfied customers, whether they are students, parents of students, alumni, or industry employer, should be a primary goal of higher education. Thus, focusing on enhancing the customer satisfaction at colleges and universities is crucial in developing customer value (Seymour in Kara and De Shields 2004:4).

Students can be regarded as customers of the universities. Therefore, it is important for the university to focus on its customers, and to meet their expectations by providing quality education. Mamun and Das (1999) completed a study and pointed out some factors that would attract students. These included library facilities, laboratory facilities and internship assistance as some of the key factors for student satisfaction.

Higher education institutions can attract students designing world class libraries, classrooms, computer laboratories, and other facilities. Students spend a considerable amount of their time using these university facilities, thus providing potential opportunities to influence student and teacher’s satisfaction.

A study done by Haque et al. (2011) identified independent factors that can affect student satisfaction based on services offered by universities. These include quality of teaching, student research facilities, library book collections and services, campus infrastructure, canteen facilities, space for group discussions, sport programs, ICT (PC and Internet) facilities etc. According to Spreng, MacKenzie and Olshavsky (1996) most prior satisfaction research has not included performance as a direct antecedent of satisfaction (e.g. Bearden and Teel 1983; Oliver and DeSarbo 1988). Service performance has become a central construct in marketing research, especially in combination with service quality. In the context of higher education, service performance which includes implicit quality is especially influenced by two factors: professors and course content. In the service context, quality is a subjective measurement and depends on tangible and intangible attributes (Mont and Plepys
The intangible nature of higher education makes it difficult for students to effectively evaluate factors such as the quality of teaching and learning, as well as the quality of student servicing. The tangible elements associated with the “education”-service include educational technology and computers, classrooms, and library facilities (educational related environment).

Petruzzellis, Uggento, Romanazzi (2006), analyzed common factors such as: lecture halls, laboratories, classrooms, equipment, library, dining hall, dormitories, leisure activities, language courses, scholarships, internet access, exam booking, contacts with teachers, administrative services, tutoring, counseling, internship, international relationship and placement.

Students have increasingly begun to see themselves as consumers or customers of a service organization, and linked with this is the high expectations of standards and efficiency from the educational institutions. Therefore, customer satisfaction is becoming increasingly important. Occasionally, expectations of international students are not met by universities (East 2001), which may have attracted these students by overstated and zealous marketing techniques. Berno and Ward (2002) found that a lack of satisfaction was associated with poorer adaptation in international students. They suggest that the difference between expectations and experiences is associated with overall adaptation: the bigger the discrepancies, the poorer the psychological and socio-cultural adaptation. Research shows that international students have lower perceptions of services offered by their universities than their domestic counterparts (Sherry, Bhat, Beaver, and Ling 2004). Some authors address several perspectives of students` satisfaction, because student satisfaction is a complex construct with various antecedents, and these are not the same as in the actual customer satisfaction models (Elliott and Shin 2002). Tinto (1982) formulates a student integration theory of persistence or retention based on the relationships between students and institutions. He argues that retention involves two commitments on the part of the student. The first commitment is the goal to obtain a college degree; and the second one is the decision to obtain that degree at a particular institution (institutional commitment). Overall, the combination of the student’s goal and institutional commitment affects retention at a particular institution. Under this perspective, it is important to match the
student’s motivation and academic ability and the institution’s ability to meet the student expectations (Kara and De Shields 2004).

To grasp the complexity of the learning experience, it is important to understand the factors that contribute to student satisfaction. For many students, “the process of studying not only represents acquisition of certain skills and theoretical knowledge; it is also related to personal growth and social development (Wiers-Jenssen et al. 2002).

By turning the focus towards the course content, the subject quality will be one of highest priority (Scott 1999). According to Elliott and Shin (2002:198) “a university’s product is more than its academic program. It is the sum of the student’s academic, social, physical, and even spiritual experiences”. Furthermore, satisfaction is positively influenced when there is positive perception of the quality (Anderson, Fornell and Lehmann 1994). Finally, Neumann (1994) ascertains that dominant predictors of instructional satisfaction include clarity of instructional tasks, professor feedback and identity of instructional tasks.

Tertiary education involves adjustment to new academic and social environments. The demands of these new environments can create stressors that may strain interpersonal relationships, undermine self-esteem and jeopardize academic performance (Khawaja and Dempsey 2008). Such demands are often more complex for international students, who have to adapt to a new culture, language, academic, and social environment (Mori 2000).

When reviewing literature on student’s satisfaction it is possible to notice that some authors also support both dimensions: social and academic. For example, Wiers-Jenssen et al. (2002) underline that there are some reasons to be cautious when applying the satisfaction approach in higher education (Wiers-Jenssen et al. 2002). Due to the theoretical discussion, satisfaction is explained in different ways: feelings and emotions are not completely taken into account as variables in the satisfaction process (Wirtz and Bateson 1999). There is a difference between institutions and subject-fields concerning the most important student satisfaction factors (Wiers-Jenssen et al. 2002). The product is the sum of the student’s academic, social, physical and spiritual experiences; research in this field does not show a consistent
pattern for student satisfaction (Wiers-Jenssen et al. 2002). They found that the important factors are close to teaching and social climate. In other words, students “require experience with the product to determine how satisfied they are with it; and it is based not only on current experience but also all past experience, as well as future or anticipated experiences” (Anderson, Fornell and Lehmann 1994:54-55).

Besides academic quality, Wiers-Jenssen, Stensaker and Grogaard (2002) assert the quality of university support facilities is very important in achieving student’s satisfaction and student’s motivation. They examine how overall student satisfaction in Norway can be broken down into component assessments, referring to broader aspects of the student’s learning experience. They see student satisfaction as students’ assessments of the services provided by universities and colleges. They broke the concept down into several sub-categories, such as:

1. Quality of teaching (academic and pedagogic).
2. Quality of supervision and feedback from academic staff.
3. Composition, content and relevance of curriculum.
4. Balance between different forms of organized teaching activities and self-tuition.
5. Quality of support facilities.
6. Quality of physical infrastructure
7. Quality and access to leisure activities.
8. Social climate.

In more detail, Guolla (1999:88) states that “a student’s satisfaction may be influenced by poor classroom facilities of which an instructor may have limited resources to change”. So, the campus environment can be seen as a web of connected happenings that influence student satisfaction (Elliott and Shin 2002). Therefore, it is necessary to enhance “the perceived value by providing services or service attributes not provided by the competition” (Claycomb and Martin 2001:391). Researchers (Wiers-Jenssen et al. 2002) found that smaller institutions have more satisfied students than larger institutions, and additionally different environments within the institution can have different influences on students.

Student’s satisfaction and teacher’s job satisfaction with university have individual, institutional and social benefits. From an institutional point of view, satisfied students
are more likely to continue in their studies and succeed academically, and this is likely to enhance the financial position and reputation of the institution. Successful universities and colleges realize that it is very important to retain enrolled students rather than concentrate on attracting new ones. One reason for this is because a competitive advantage can be gained through student satisfaction (Elliott and Shin 2002) and they can be marketed in the university’s marketing tools. Satisfied students make effective public relations agents.” Highly satisfied students “engage in favorable word-of-mouth publicity”. Word-of-mouth from satisfied students lowers the cost of attracting new customers for the university and enhances the university’s overall reputation, while that of dissatisfied students has the opposite effect (Fornell 1992). Also, they can return as graduate students, recruit prospective students or regularly donate as alumni. The most mentioned relationship-building practices are referrals, testimonials, and visits to customers’ sites by potential customers.” Understanding the underlying dimensions of student satisfaction and the factors that contribute to student satisfaction has several potential benefits and applications for institutions, students, and society (Wikiversity).

As mentioned above, the literature on student’s satisfaction and student’s perception of academic experience is very complex. Two threads of perspectives are apparent: the academic and the social. The authors supporting one or the other perspective mention the factors that can affect student’s satisfaction with their university. Many authors underline the importance of the same factors (for example Harvey (1995) and Hill (1995). They both mention library services, accommodation services, course content, teaching quality, catering service, academic workload and so on.

In addition in 2001 UCC Student Services Evaluation Report analyzed student’s satisfaction using the following categories: general climate, admissions/records, academic advising, financial aid and awards, counseling, assessment center, athletics, health clinic, computer labs, library, bookstore.

The literature reveals that universities are becoming more aware of the importance of student satisfaction. In addition, various studies have shown that student satisfaction has a positive impact on student motivation, student retention, recruiting efforts and fundraising.
A satisfaction and dissatisfaction level within an individual influences the motivation level and his/her performance throughout the life. When an individual is satisfied with his/her work, he/she gets pleasure and feels motivated. Obtaining satisfaction from their education system is very important for students as this will lead to better learning possibilities. This paper aims to assess educational environment effect on educational satisfaction among the students and teachers.

Students are one of the important assets of any society. Well-being of society depends upon its students because these are the people who will take the responsibility of the success of the society in future and in achieving this goal teacher’s role is extremely important. Teachers are the source of guidance in all the crucial steps in academic life of the students. People are interested to work in the institutions as well as in the services where they feel satisfied. Job dissatisfaction leads to reduced level of performance (Brett & Thomas, 1992); it increases turnover and turnover intentions (Motowidlo, 1983) and also leads to absenteeism (Weiner, 1980).

Michael (1997) describes the university in the following way: “in its purest sense, a university is an assemblage of communities with different ideologies, agenda, and academic traditions held together by a common institutional logo and name”. As a result, students can be and should be seen as customers and key stakeholders (Tonks & Farr, 1995). Hill (1995) suggests that the primary customers of the universities are the students and so Higher Education “is increasingly recognizing that it is a service industry and is placing greater emphasis on meeting the expectations and needs of students” (Elliott & Shin, 2002, p. 197). Furthermore, researchers argue “that relationships are important and that the overall market orientation of organizations needs to be translated to a relationship level in order to be effective” (Helfert, Ritter & Walter, 2002, p. 1119). Conferring to Gronroos (1989), the marketing aim should be the development of long-term “customer relationships because they are a university’s most valuable resources.

In the relationship marketing concept “satisfaction has developed extensively as a basic construct for monitoring and controlling activities and is therefore often viewed as a central determinant of customer retention” (Hennig-Thurau & Klee, 1997). Nevertheless, satisfaction appears to mean different things to different people (Giese
Satisfaction can be viewed as an outcome of a consumption activity or experience (Hennig-Thurau & Klee, 1997; Parker & Mathews, 2001; Padilla, 1996). When universities accept the students as an important customer group a revolutionary change in the management in Higher Education will be in place (Owlia & Aspinwall, 1997). Especially when a relationship management approach is adopted, the basic understanding of what the students want is vital (Petry, 1996). It is obvious that student satisfaction in the university context is central for the students and the providers. Only a few universities routinely measure satisfaction. Additionally, most of those measurements are not used for marketing planning, evaluation and controlling (Piercy, 1995). According to Elliott & Shin (2002, p. 197) “focusing on student satisfaction not only enables universities to re-engineer their organizations to adapt to student needs, but also allows them to develop a system for continuous monitoring of how effectively They meet or exceed student needs”. So, the student satisfaction approach is important for the development of a culture of continuous quality improvement (Aldrige & Rowley, 1998). Elliott and Shin (2002) argue that satisfaction is a worthy outcome variable to study because it has a number of student and course related benefits including increases in motivation, lower attrition rates and a greater number of referrals. There are some reasons to be cautious when applying the satisfaction approach in Educational environments (Wiers-Jenssen, Stensaker & Grogaard, 2002): due to the theoretical discussion satisfaction is explained in different ways; feelings and emotions are not completely taken into account as variables in the satisfaction process (Wirtz & Bateson, 1999); there is a difference between institutions and subject-fields concerning the most important student satisfaction factors (Wiers-Jenssen, Stensaker & Grogaard, 2002); student satisfaction is a complex construct with various antecedents and these are not the same as in the actual customer satisfaction models; student satisfaction is a continually changing construct in the Higher Education environment due to repeated interactions (Elliott & Shin, 2002); student satisfaction is an overall response not only to the learning experience of a student (Wiers-Jenssen, Stensaker & Grogaard, 2002); Sevier (in Elliott & Shin, 2002, p. 198) argues that a university’s product is more than its academic
program. The product is the sum of the student’s academic, social, physical and
spiritual expert. Special Edition on Consumer Satisfaction – Global Perspective
emcees”; research in this field does not show a consistent pattern for student satisfaction (Wiers-Jenssen, Stensaker & Grogaard, 2002) and till now no student satisfaction model is existing. In other words, the students “require experience with the product to determine how satisfied they are with it and it is based not only on current experience but also all past experience, as well as future or anticipated experiences” (Anderson, Fornell & Lehmann, 1994). In this context, student satisfaction is defined as the student’s fulfillment response. It is the individual overall subjective evaluation and experience of a product/service feature, the product/service itself and between what was received and what was expected from a specific service provider to date (Anderson & Sullivan, 1993; Anderson, Fornell & Rust, 1997; Oliver, 1999). So, expectations are defined “as beliefs about a product’s attribute or performance at some time in the future” (Spreng, MacKenzie & Olshavsky, 1996).

To grasp the complexity of the learning experience, it is important to understand the factors that contribute to student satisfaction. For many students, “the process of studying not only represents the acquisition of certain skills and theoretical knowledge. It is also related to personal growth and social development” (Wiers-Jenssen, Stensaker & Grogaard, 2002).

2.3.2 Student Satisfaction Theories

Several theoretical models explain student satisfaction. These theories vary in their description of student satisfaction. However, all models treat student satisfaction as an outcome variable.

A) The investment model

The “investment model” is based on Rusbult’s (1980) theory that one’s level of satisfaction, initial investment, and the quality of available alternatives all affect one’s commitment and decision to stay or leave. The initial model, however, was used to test personal relationships rather than non-relational domains. Testing Rusbult’s model on students, Hatcher, Kryter, Prus, and Fitzgerald (1992) found that when students are satisfied and alternatives to their commitment are of lesser quality, they
will subsequently commit to their studies. One outcome of student commitment is persistence.

In a meta-analysis, **Le and Agnew (2003)** confirmed that the investment model is a significant predictor of one’s desire to stay or leave in both relational and non-relational domains. The researcher reviewed 52 studies that containing 60 independent variables and 11,582 participants and found that the significant predictors of satisfaction with, alternatives to, and investment in a relationship explained over two-thirds of the variance in commitment. Commitment was found to be a significant predictor of “break-up” or, in the case of a non-relational domain; commitment was a significant predictor of departure. Although the investment model is a significantly stronger predictor of stay-leave behavior in the relational domain, this research confirms that the investment model can be used to understand the relationship between satisfaction and persistence in the no relational domain of college student persistence.

Even with empirical confirmation, there may be problems with the investment model. The model relies on the idea that students” perceptions are based on isolated thoughts without any other influences. **Benjamin and Hollings (1997)** suggested that the model is “problematic in positing disembodied cognitive processes, free of past, present, or future, or of contexts or relationships”.

**B) The application of Holland’s vocational-personality types model**

Although not initially related to higher education, **Holland’s (1997)** vocational personality and work environment theory can be adapted to student satisfaction. When applied to higher education, Holland’s vocational personality theory states that students will be more successful, more likely to persist, and more satisfied when there is a congruence between the individual and the environment (**Smart, Feldman, & Ethington, 2006**). Holland’s theory is based on a fit that occurs when people match their personality types with their environment. The six personality types suggested by Holland are based upon a person’s abilities, attitudes, and interests. The six types are: realistic, investigative, artistic, social, enterprising, and conventional. The theory also states that people will seek environments that match their abilities, attitudes, and
interests. Additionally, people will feel as if they “fit” when their abilities, attitudes, and interests are congruent with their environment.

Critics have suggested that the fit model lacks precision (Benjamin & Hollings, 1997). Specifically, Baird (1988) noted that the studies of congruence do not often specify whether the results were based on the total level of correlation, the relationships between the elements important to the student, the association of the research criteria, or some combination of the three.

In relating the vocational personality’s theory to student satisfaction, the more the student “fits” on campus, the more likely he or she is to succeed and be satisfied with campus experiences (Feldman, Ethington, & Smart, 2001; Feldman, Smart, & Ethington, 1999). Using data from the Cooperative Institutional Research Program (CIRP), higher levels of vocational personality-environment fit were related to higher levels of satisfaction and achievement in college (Feldman et al., 2001) and in major (Feldman et al., 1999). In fact, Porter and Umbach (2006) found that personality type was highly predictive of a student’s choice of major. The researchers further stated that using Holland’s personality types may be a useful tool when advising students about major fields. They stated, “Assisting students in making informed decisions about the selection of a major should promote greater student satisfaction with and success in their undergraduate experience” (p. 445). Bean and Bradley (1986) found additional support for the link between institutional fit and satisfaction. Surveying over 1,500 students, the researchers found that institutional fit was significantly correlated with satisfaction ($\beta = 0.225, p < .001$). However, institutional fit was a stronger predictor of satisfaction in women ($\beta = 0.275, p < .001,$) than men ($\beta = 0.127, p < .001$). Even with these stronger indicators of satisfaction, it must be noted that this study was conducted on only White students attending a major Midwestern university who were enrolled in 10 units or more.

C) The consumer model

The consumer approach to higher education assumes that education is a product, and students will consume that product based on their perceived level of satisfaction. Pate (1993) initially tested the consumer model within the context of higher education and found that satisfaction data can be a powerful tool to enable administrators to affect
policy and program changes that may lead to increased student satisfaction. Pate also noted that improving satisfaction levels affect current consumers’ decisions about the likelihood of supporting the institution in the future. Even though the consumer model runs the risk of making education a commodity, it views the student as a stakeholder whose views are worthy of consideration. In quality assurance programs, it is considered best practice to utilize student-stakeholder input to gather data on satisfaction (Williams, 2002). This data can be used to effect changes in program, policies, and procedures as part of an overall assessment plan (Bryant, 2006; Juillerat & Schreiner, 1996, 2004).

D) The Outcomes of Student Satisfaction
When students are satisfied, the overall perception of campus climate is improved (Juillerat & Schreiner, 2004). Other outcomes such as improved public relations and morale are also realized (Bryant, 2006; Juillerat & Schreiner, 2004). Important to this study, loan default rates may also be affected by satisfaction (Bryant, 2006; Flint, 1997; Volkwein et al., 1998). Research has shown that there is a strong link between satisfaction and both student persistence and student achievement. These specific relationships are explored in more depth as they pertain to this study.

2.3.3 Relationship between educational satisfaction and achievement
Beyond persistence and retention, research on student satisfaction has often explored the relationship of satisfaction and student achievement. The body of research suggests that student satisfaction is directly related (Aitken, 1982; Bean & Bradley, 1986; Pike, 1993) as well as indirectly related (Aitken, 1982) to achievement measures such as GPA, time spent studying, and graduation and motivation (Elkins et al., 2000). Additionally, student satisfaction has been shown to correlate with perceived skills development in college (Bailey, 2009).

Donahue and Wong (1997) reviewed the relationship between satisfaction and achievement for both traditional students and non-traditional students. The researchers surveyed 124 students using the College Student Satisfaction Questionnaire (Betz, Klingensmith, & Menne, 1970) and the Work and Family Orientation Questionnaire (Helmreich & Spence, 1978). The correlation between the two surveys showed that nontraditional students are more focused on their academic
work and interested in the rewards (grades and graduation) of their degree program. Traditional students are more interested in the academic challenge and quality of education on campus. This difference may relate to the non-traditional student’s focus on career development and job training rather than overall personal development. As it relates to this study, nontraditional students attending for-profit colleges and universities should be more satisfied when their academic work is focused on application to specific career or vocational skills.

**2.3.4 JOB SATISFACTION**

*Job satisfaction* is defined as the extent to which people like (satisfaction) or dislike (dissatisfaction) their jobs” (Spector, 1997). This definition suggests job satisfaction is a general or global affective reaction that individuals hold about their job. While researchers and practitioners most often measure global job satisfaction, there is also interest in measuring different "facets" or "dimensions" of satisfaction. Examination of these facet conditions is often useful for a more careful examination of employee satisfaction with critical job factors. Traditional job satisfaction facets include: coworkers, pay, job conditions, supervision, nature of the work and benefits” (Williams, 2004).

Job satisfaction is an attitude that is simply how content an individual is with his or her job; whether he or she likes the job or not (Spector, 1997). It is assessed at both the global level (whether or not the individual is satisfied with the job overall), or at the facet level (whether or not the individual is satisfied with different aspects of the job) (Spector, 1997). According to Spector (Spector, 1997). Lists 14 common facets: Appreciation, Communication, Coworkers, Finge benefits, Job conditions, Nature of the work, Organization, Personal growth, Policies and procedures, Promotion opportunities, Recognition, Security, and Supervision). Job satisfaction scales vary in the extent to which they assess the affective feelings about the job or the cognitive assessment of the job. Affective job satisfaction is a subjective construct representing an emotional feeling individuals have about their job (Thomspson, 2012) Hence, affective job satisfaction for individuals reflects the degree of pleasure or happiness their job in general induces. Cognitive job satisfaction is a more objective and logical evaluation of various facets of a job. Cognitive job satisfaction can be
unitdimensional if it comprises evaluation of just one facet of a job, such as pay or maternity leave, or multidimensional if two or more facets of a job are simultaneously evaluated. Cognitive job satisfaction does not assess the degree of pleasure or happiness that arises from specific job facets, but rather gauges the extent to which those job facets are judged by the job holder to be satisfactory in comparison with objectives they themselves set or with other jobs. While cognitive job satisfaction might help to bring about affective job satisfaction, the two constructs are distinct, not necessarily directly related, and have different antecedents and consequences (Moorman, 1993).

Job satisfaction can also be seen within the broader context of the range of issues which affect an individual's experience of work, or their quality of working life. Job satisfaction can be understood in terms of its relationships with other key factors, such as general well-being, stress at work, control at work, home-work interface, and working conditions (Tomazevic, 2014).

**Job satisfaction** is the extent to which one feels good about the job. It is in regard to one’s feelings or state of mind regarding to the nature of their work. In other words, job satisfaction implies doing a job one enjoys, doing it well, enthusiasm and happiness with one's work.

Everyone define job satisfaction as fulfillment of one’s expectation. It differs from person to person and institution to institution and even in the context of male and female. In simple term when someone is satisfied with his job that is job satisfaction. Job satisfaction as a pleasurable positive emotion state, resulting from the appraisal of one’s job or job experiences. It results from the perception that one’s job fulfils or allows the fulfillment of one’s important job values, providing and to the degree that these values are congruent with one’s needs (Locke, 1976). Therefore, job satisfaction is such phenomenon which comes not only from the job, but also from one’s personal, social, academic, administrative and economical condition. Job Satisfaction, according to Thorndike and Barnhart (1979), is the “fulfillment of conditions or desires” . Therefore, one would expect a person is satisfied when his or her expectations or desires have been met. The 1993-94 Schools and Staffing Survey
asked teachers if they were satisfied with different aspects of their work environment (administrative support and leadership, buffering and rule enforcement, cooperation among staff, adequacy of resources, and overall satisfaction). Not one area received higher than 30 percent of the teachers being satisfied (Alt et al., 1999). The 1992 Metropolitan Life Survey (Harris & Associates, 1992) of new teachers revealed that 70 percent of second year teachers were very satisfied with working with their students, 58 percent were satisfied working with other teachers in their school, and only 25 percent indicated satisfaction with working with parents. New teachers tend to be less satisfied with their job than teachers with experience (Mertler, 2001; Harris & Associates, 2001). Data from the National Education Association (1997b) revealed that 62.6 percent of the teachers surveyed would become a teacher again.

2.3.5 Teachers’ job satisfaction

*Explanation of the concept of Teachers’ job satisfaction*

Teacher satisfaction in the context of this study is defined as the perception that teaching in the environment is ‘effective and professionally beneficial’. Lester (1982) defined faculty job satisfaction as the extent to which a teacher perceives and values various factors such as evaluation, collegiality, responsibility and recognition. Teacher job satisfaction refers to a teacher’s affective relation to his or her teaching role and is a function of the perceived relationship between what one wants from teaching and what one perceives it is offering to a teacher (Zembylas & Papanastasiou, 2004).

Herzberg, (1957) defines job satisfaction as a multidimensional attitude wherein an employee can be satisfied with specific job activities, with work place conditions under which the job is performed or with the salary, security or social prestige associated with the job.

According to Ingersoll (1999), the working conditions, structural features, and managerial practices of the organization are linked to employee motivation, employee commitment, and employee retention.
Anthony, (2007) describe the occurrence of job satisfaction being when employee’s skills are effectively utilized, when training opportunities to enhance those skills are provided, and when the work environment is conducive to enabling employees to perform to the best of their ability. Job satisfaction as “a positive feeling about one’s job resulting from an evaluation of its characteristics” (Robbins & Judge, 2009). College Teachers are the most important group of professionals for our nation’s future. Therefore, it is astonishing to know that even today many of the college teachers are dissatisfied with their jobs. Job satisfaction among college teachers is good not only for themselves but society as a whole. It increases productivity and classroom performance in the college. Wellbeing of any society depends upon the role played by the teacher. Teachers are the source of guidance in all the crucial steps in the academic life of the students. When teachers are satisfied with their job they can perform their responsibilities with more concentration and devotion. In order to derive the determinants of teacher job satisfaction, the three indicators presented above will be regressed on five groups of variables:

1. Variables describing the classroom environment and school facilities (class size and structure, students initial performance, availability of books, electricity, tables, blackboards and other equipment, proximity of the next city...)
2. Variables describing the teachers own characteristics (gender, family status, job experience, qualification...)
3. Variables describing the teachers’ contract conditions (civil servant or private employee, job perspectives, additional work apart from teaching...)
4. Variables describing the human relations, teacher’s supervision and responsibilities (exchange with colleagues, meetings with the director, control by parents and school inspector.).

Satisfaction with the teaching component has important consequences. It means that the teachers are happy, dedicated and committed, and it also helps them to bring their best qualities to their schools, so that students, parents, and the society may benefit from their services (Ofoegbu, 2004:82). As indicated by Jaiyeoba and Jibril (2008:97), satisfied and motivated teachers are important for any educational system.
The success or failure of the education system depends mainly on satisfied teachers, but also on satisfied school managers and administrators. Teachers, specifically, spend a great amount of time with their students in class, and hence they have a significant impact on student achievement (Correnti, Miller & Rowan, 2002; Jyoti & Sharma, 2009).

Thus, as outlined above, satisfaction with their teaching career not only plays an important role in the lives of the teachers themselves, but also in the lives of the students and the parents, and for the sustainment of quality education at large. Studies indicated that the quality of education depends on the professionalism and devotion of the teachers. It is impractical to realize positive changes in the schools without the teachers’ commitment to and participation in reform. The quality and morale of the teachers are essential to the success of any educational reform (Kim, 2000:35).

The teachers’ job satisfaction has a significant influence on, and important implications for their effectiveness and their delivery of quality education. According to Mwamwenda (in Badenhorst, George & Louw, 2008:140), a lack of teacher job satisfaction results in frequent teacher absenteeism from school, aggressive behavior towards colleagues and learners, early exits from the profession, and psychological withdrawal from the work. All of these negative results lead to poor quality teaching. Other studies showed that a lack of job satisfaction is often accompanied by feelings of gloom, despair, anger, resentment and futility (Pinder, 2008:277). Thus, a lack of job satisfaction has serious implications for the teacher, as well as for the educational system in which he or she is employed.

Job satisfaction is the extent to which one feels good about the job. It is in regard to one’s feelings or state of mind regarding to the nature of their work. In other words, job satisfaction implies doing a job one enjoys, doing it well, enthusiasm and happiness with one's work. Everyone define job satisfaction as fulfillment of one’s expectation. It differs from person to person and institution to institution and even in the context of male and female. In simple term when someone is satisfied with his job that is job satisfaction. Job satisfaction as a pleasurable positive emotion state, resulting from the appraisal of one’s job or job experiences. It results from the perception that one’s job fulfils or allows the fulfillment of one’s important job.
values, providing and to the degree that these values are congruent with one’s needs (Locke, 1976). Therefore, job satisfaction is such phenomenon which comes not only from the job, but also from one’s personal, social, academic, administrative and economical condition.

As compared to other levels of educational system in the society, higher education has a much bigger role to play. Being at higher level of the educational pyramid and thus able to influence other levels of education, and having wider access to all available knowledge, it can undoubtedly operate as a powerful instrument to help the process of social change in any society. It nurtures the competency of future leadership in the students who hold the potential to develop the society. It prepares them to successfully carry out different responsibilities for social, economic and political development. Higher education is 'higher' also because it is at the frontier of knowledge trying to further expand these frontiers.

University's teachers are arguably the most important group of professionals for our nation’s future. Therefore, it is disturbing to find that many of today’s teachers in higher education are dissatisfied with their jobs. Job satisfaction is good not only for employees but society as a whole. It increases productivity and classroom performance in the educational environments. These aspects are important in higher education in the world. But without job satisfaction among the behaviour of the University and college teachers, the objective of providing quality education would not be materialized. Therefore, job satisfaction is needed among college teachers to promote quality education.
School Characteristics:
(1) Student academic achievement in reading – (the higher the level of student achievement on end-of-grade reading tests, the higher the level of job satisfaction);
(2) Student academic achievement in math – (the higher the level of student achievement on end-of-grade math tests, the higher the level of job satisfaction);
(3) School size – (the smaller the school size, the higher the level of teacher job satisfaction);
(4) Teacher turnover rates – (the lower the rate of teacher turnover, the higher the level of job satisfaction);

Teacher Characteristics:
(5) Teacher’s attendance – (the fewer sick leave days used, the higher the level of job satisfaction);
(6) Teacher’s years of teaching experience – (the more years of experience, the higher the level of job satisfaction);
(7) Teacher’s educational level – (the higher the percentage of teachers with advanced degrees, the higher the level of job satisfaction);
(8) Teacher’s licensure status – (the higher the percentage of fully licensed teachers, the higher the level of job satisfaction);

Student Characteristics:
(9) The percentage of minority students – (the lower the percentage of minority students proficient in math and reading, the lower the job satisfaction);
(10) The percentage of economically disadvantaged students (the lower the percentage of minority students proficient in math and reading, the lower the job satisfaction).

Learning environments and school characteristics comprised middle school student academic achievement on end-of-grade math and reading tests; the size of the school in terms of number of students enrolled in each school; and the teacher turnover rate for each middle school. For each school characteristic, it was expected that the higher the academic achievement of students on end of grade math and reading tests, the higher the level of teacher job satisfaction. Likewise, the smaller the school size, the higher the level of teacher job satisfaction. And, the lower the rate of teacher turnover in the school, the higher the level of teacher job satisfaction.

Teacher characteristics included middle school teacher’s attendance records with number of sick leave days serving as a measure of teacher attendance; teacher’s years of teaching experience from zero years of experience to 10 or more years of experience; teacher’s educational levels depicted by the percentage of teachers with advanced degrees; and teacher’s licensure status determined by the percentage of teachers who were fully licensed. For each teacher characteristic, it was expected that
fewer sick leave days used would indicate a higher level of job satisfaction; teachers with five or more years of experience would indicate a higher level of job satisfaction; a high percentage of teachers with advanced degrees would yield a higher level of job satisfaction; and a higher percentage of fully licensed teachers would yield a higher level of job satisfaction.

Student characteristics comprised the percent of minority students passing end-of-grade tests in reading and math and the percent of economically disadvantaged students (determined by the percentage of students receiving free and reduced-price lunches), in each middle school. For each student characteristic, it was expected that low percentages of minority students and low percentages of economically disadvantaged students passing end of grade tests in reading and math would indicate low levels of job satisfaction among teachers in those schools. The expectations described above are in line with other research findings (Bridges and Hallinan, 1978; Ostroff, 1992) that reported that teacher collegiality and smaller subunit sizes within an organization or smaller teams of students and teachers would affect communication among teachers as well as teacher’s sense of “belongingness;” and would therefore, positively influence teacher’s job satisfaction and student achievement. With these assumptions school organizational behaviors may be analyzed to assess organizational structures likely to influence teachers’ job satisfaction. Through analyzing the relationships of these variables to job satisfaction, it was expected to determine why teachers in some schools experienced more job satisfaction than others. For example, the study sought to determine whether schools where high percentages of teachers with advanced degrees or teachers with five or more years of experience were more satisfied with their jobs than teachers in schools with low percentages of teachers with advanced degrees or fewer than three years of experience.

The theoretical assumptions upon which this research is based come from the work of organizational theorist Frederick Herzberg (1957; 1976) who discusses motivation theory as founded on basic human needs. He believed satisfaction of the needs of workers motivates them to improve production. Meeting their needs would motivate workers to be satisfied or not satisfied with their work environments. Herzberg differs
from Abraham Maslow’s (1943) theory where there is a hierarchy of basic human needs wherein one level of needs in the hierarchy must be satisfied before other levels of needs can be satisfied. Herzberg’s theory stipulates that multiple factors that are both intrinsic and extrinsic, contribute to human satisfaction attitudes simultaneously. **Maslow’s (1943)** theory of motivation included five basic needs individuals are motivated to achieve. These needs are hierarchical in nature and are related to each other in that as one level of need is achieved the next need in the hierarchy comes to the forefront and occupies an individual’s consciousness until it is fulfilled. Maslow also believed that when one need was satisfied, it no longer served as the basis for an individual’s behavior.

Maslow’s theory included physiological, safety, love, esteem, and self-actualization needs. **Herzberg’s (1976)** theory of human motivation maintains that the biological and psychological needs of humans are parallel systems and the five basic needs Maslow described are not hierarchical and do not assume importance over one another as each is fulfilled. Herzberg’s (1976) need factors that produce job satisfaction (and motivation) are separate from the factors that produce job dissatisfaction. Herzberg’s (1976) basic needs are categorized as growth or motivator factors intrinsic to the job (achievement, recognition for achievement, the work itself, responsibility, and advancement) and dissatisfaction-avoidance or hygiene factors that are extrinsic to the job (company policy and administration, supervision, interpersonal relationships, working conditions, salary, status, and security).

### 2.3.6 Satisfaction and Student Characteristics

Such student characteristics as socio-economic status and race can possibly influence the job satisfaction of teachers. The MetLife Survey of the American Teacher 2001 (Key Elements of Quality Schools) found that minority students from low-income backgrounds receive the least quality teaching. In this survey, “quality teaching” referred to teachers knowing their subject matter, caring about students, believing all students can learn, maintaining discipline, and teaching individual students according to their needs and abilities (Markow, Fauth and Gravitch, 2001). These findings reveal that teachers in schools with high proportions of low-income students are less likely to give the teachers in their school an “A” in knowing their
subject areas and caring about students. Low-income students gave similar assessments and attested to the idea that low-quality teaching appeared to be more prevalent in schools with high proportions of minority students. Likewise, schools with mostly minorities were less likely to give the teachers in their schools “As” in knowing their subject areas, caring about students and maintaining discipline (Markow, Fauth and Gravitch, 2001). Secondary school educators are less likely than elementary educators to rate their relationships with students, colleagues and parents as very satisfying and were less likely than elementary educators to rate their schools as having high academic standards (Markow, Fauth & Gravitch, 2001). Lastly, the findings revealed that high-income students were more likely than low-income students to believe their teachers and parents expected excellent work from them and low-income students were more likely to perceive that their teachers and administrators as having low expectations of them.

Ashton and Webb’s (1986) research on teachers’ sense of efficacy and student achievement revealed that students’ personal characteristics were related to teacher expectations and teacher behaviors. The socioeconomic class, race, attractiveness of students, and classroom behavior influenced teachers’ expectations for students’ performance (Ashton and Webb, 1986). They noted that teachers tended to avoid and criticize uncooperative students and focused strongly on controlling the behavior of these types of students and neutralizing the conflict they caused rather than on teaching and socializing these students in a positive direction. Also, teachers tended to reject students who were openly hostile and disruptive and became locked into patterns of mutual frustration, negative effects, and hostility with these students (Ashton and Webb, 1986). In schools with numerous students of low socioeconomic status there was more conflict between school administrators and teachers because administrators believed teachers lacked motivation and needed more rules and procedures governing the curriculum, grading, and testing than for teachers in high SES schools (Ashton and Webb, 1986).

Therefore, one may reasonably assume that student characteristics will influence teachers’ job satisfaction.
2.3.7 Satisfaction and Teacher Characteristics
It is expected that teacher characteristics, a teacher’s licensure status, years of experience and education may influence teachers’ job satisfaction. As teachers demand increases and funding inequities widen, many urban and poor rural districts employ more teachers with emergency permits or waivers to teach (Darling-Hammond, Holtzman, Gatlin, and Heilig, 2005). Because these individuals typically teach low-income and minority students in the most disadvantaged schools, one may assume that these teachers experience less job satisfaction. This research sought to determine whether this assumption is valid. It controlled the influence of teachers’ licensure status, years of experience, and education on their job satisfaction. The Darling-Hammond, et al. (2005) study revealed that when controlling for years of experience, educational level, and student characteristics, certified teachers produced better student achievement gains than non-certified teachers. The authors inferred that one can predict level of job satisfaction for teachers based on their perceptions of effectiveness in performing job duties in meeting student achievement goals. Cheng (1993) correlated school culture with teachers’ attitudes toward their work and found that positive school cultures produced more highly motivated teachers (Stolp, 1994). Cheng’s research suggests that in school environments with strong organizational ideology, shared participation, charismatic leadership, and intimacy, produce teachers with higher job satisfaction (Stolp, 1994). Ashton and Webb’s (1986) research found that teachers feel isolated from their peers during the school day and because teachers have social needs, isolation contributes to less job satisfaction. Consequently, school structures that enhance collegial interaction produce teachers with positive attitudes (Ashton and Webb, 1986).
Seven areas support job satisfaction for teachers regardless of a teacher’s years of experience, level of education (Katzenmeyer and Moller, 2001); and licensure status:

1. Developmental focus,
2. Recognition,
3. Autonomy,
4. Collegiality,
5. Participation,
6. Open communication,
7. Positive environment.

Developmental focus refers to teachers obtaining new knowledge and skills (Katzenmeyer and Moller, 2001). Recognition is the ideas and opinions of teachers (Katzenmeyer and Moller, p. 137). Autonomy is teachers taking the initiative to make improvements for students and creating visions for their school (Katzenmeyer and Moller). Teacher autonomy focuses on what is in the best interest of students; collegiality is the collaboration of teachers on instructional planning and participation is being actively involved in making decisions on school important matters. Open communication is honest communication between teachers and administrators where teachers feel informed about school matters (Katzenmeyer and Moller). Lastly, a positive environment refers to how teachers are viewed and treated as professionals where there is satisfaction with the work environment (Katzenmeyer and Moller). In sum, when these seven mediating variables are present schools teacher characteristics (years of experience, level of education, and licensure status) typically influence teachers’ job satisfaction.

2.3.8 Effect of classroom on educational satisfaction and achievement

There are growing concerns about designing classroom or school environments influencing teaching and learning activities. However, there is little research on the relationship between physical characteristic of the classroom and teaching and learning activities. Most researcher focus on how the classroom or school building can be used effectively based on a set of established standard, and the effectiveness of these physical characteristics has been measured by academic achievement of the
students. Teaching and learning perspectives were rarely taken even though the classroom and school buildings are the places where instructional activities take place and the learning agents such as teacher, learner, and facilities interact with each other. Thus, this research aims to reveal the different perception of college students on their classroom environments depending on where they take class, traditional classroom or technologically savvy classroom. Also, the study demonstrates how the difference of classroom environment affects students’ satisfaction of the class and motivation. To perform the study, the questionnaire about the satisfaction of the classroom environment was developed, and published class satisfaction survey instrument were used. To identify which factors influence classroom environment, an exploratory factor analysis (EFA) was performed. This study can serve as base research for the further research on the relationship between physical aspects of the learning environment and teaching and learning and educational satisfaction of teachers and students. The precedent studies concerning which factors among the various physical characteristics of a classroom affect students’ learning suggest various factors. Even though conflicting results are shown on the same factors depending on the context of each study, factors such as structure of a classroom, ICT, visuality, ventilation, lightening (Cash, 1993; Zandvliet & Straker, 2001; Bosch, 2003; Higgins, Hall et als, 2005) are indicated important affecting students’ learning.
2.4 Review of related research studies

As the present study sought to correlation between educational environment and educational satisfaction of teachers and students in Pune universities and Shiraz universities, due to exposure of effect of educational environment on students and teachers in learning and teaching process, the investigator has gone through number of available research studies relevant to the research are in support of and in participation of the methodology and analysis presented in this study.

2.4.1 Specific studied conducted

There was a growing research literature that there is a relationship between student achievement and the conditions of school buildings (Buckley, Schneider, & Shang, 2004a; Earthman, 2002; Lemasters, 1997; Lewis, 2000; Filardo, 2008; Hunter, 2006; Jago & Tanner, 1999; Schneider, 2003b). Hale (2002) found that students in classrooms with large windows, natural lighting, and well-designed skylights performed 19 to 26% better than their peers in classrooms without these features. Hunter found that the environmental conditions in schools, which included the inoperative heating system, inadequate ventilation, and poor lighting, affected the health and learning as well as the morale of students and the staff. Olson and Kellum (2003) found sustainable schools and the good qualities of lighting, site planning, indoor air quality, acoustics, healthy building materials, and the use of renewable energy benefited student achievement. Bullock (2007) found that students performed better in schools that were new or renovated recently than in olderschools. The overall building condition, the age of the building, and the windows in the instructional areas were positively related to student achievement (Bullock, 2007). The key to the economic prosperity of our communities and nation was our public schools (Filardo, 2008). Filardo noted that responsible management and investment in our school buildings paid three times—for skilled jobs in local communities, in the quality that healthy, safe, and educationally appropriate buildings created for students as well as teachers, and in the benefits that quality education reaped for generations to come. Gertel, McCarty, and Schoff (2004) indicated areas that had not received a great deal of attention such a administration buildings and teachers’ classrooms for
daily instruction. Therefore, it was important for educational environments facilities to provide an appropriate environment for learning. The challenge for educators was to renovate or design buildings that provided the appropriate infrastructure for new learning approaches, mode of instruction, as well as tools for technology that improved teaching and learning, (Dewees, 1999).

2.4.2 Background of the Study

The enactment on NCLB mandated accountability for academic achievement for all students in every state, school district, and school. Many school districts were struggling to meet the requirements of NCLB. NCLB stipulated that every school must have highly qualified teachers in the classroom, teachers’ assistants with two years of college or equivalent, and a curriculum that allowed the students to be proficient on all standardized tests. While the school districts and schools were trying to meet the requirements of NCLB, there was an important element of student achievement that educators had overlooked, the physical school facility. Research literature indicated that student achievement depended upon the physical school facility, its age, the design, and the condition of the school (Broome, 2003; Hughes, 2005; Lyons, 2001).

Lyons (2001) contended that learning was a complex activity that supremely tested students’ motivation and physical conditions. Teaching resources, teachers’ skill, and curriculum played a vital role in a child’s education (Lyons, 2001). Educators must realize that there were many elements that influenced the condition of the school facility. These elements could range from educational leadership to community involvement. There was no one element that operated in isolation (Lyons, 2001). Educators needed to be informed about the conditions of their school facilities as well as appreciate the differences that facilities could make in helping to educate their children.

Schneider (2002) noted that most of the school buildings were about fifty years old. Faced with an aging building stock and growing, shifting student enrollments, states and communities were working hard to build and modernize K-12 facilities. In today’s society, many of our schools faced many challenges of out-of-date design, deteriorating conditions, and changing utilization pressures (overcrowding and
declining enrollments; These deficiencies impaired the quality of teaching and learning that contributed to health and safety problems for staff and students. Building design had been associated with teacher motivation and student achievement (Filardo, 2008).

Lackney (1999a) presented a paper to the U. S. House of Representatives Committee on Science that discussed the impact of educational facilities on student behavior, attitudes, and performance. Lackney (1999a) concluded that school buildings were important to the teaching and learning process. Lackney (1999a) also asserted that there was a relationship between physical characteristics of school buildings and educational outcomes. O’Neill (2000) investigated the relationship between student achievement, school facilities, attendance, behavior, and teacher turnover rate. The study supported the research that school facilities that were well designed and maintained would enhance the learning environment for teachers and students. O’Neill and Oates (2001) explored whether improving school facilities had a positive effect on student behavior, attendance, student learning and teacher turnover rate. O’Neill and Oates found that there was a direct relationship between student achievement and building quality.

Earthman (2002) found that school facility conditions do affect student academic achievement. Earthman (2002) concluded that school building design features and components have a measurable influence upon student learning. The TACIR (2003) conducted a study in connection with school facilities, learning and teaching, found that the age of the facility, condition of the facility, thermal factors, visual and lighting, color of the indoor facilities, external noise, and air quality all correlated with positive educational outcomes.

Earthman (2004) examined the relationship between building quality university design and academic outcomes. He found that there was a relationship between building quality and academic outcomes. Further, Earthman (2004) rated temperature, heating, and air quality as the elements that affected student achievement.

Hadden (2005) identified features that existed in Georgia’s schools to determine trends in school design. The study examined the physical environment and the functional environment of the schools that included (a) energy efficient, flexible, and
sustainable designs; (b) aesthetics; (c) safety; (d) collaboration; (e) classroom space and furnishings; (f) technology; (g) organization of classroom administrative offices, (h) student communal spaces and school grounds; (i) teacher facilities; (j) instructional and social program services and opportunities; (k) classroom instructional opportunities; (l) instructional opportunities and educational programs; (m) organization of instruction; and (n) community or social use. Hadden’s study supported the research that facilities did impact student learning and satisfaction by shaping the environment.

In Ethiopia, a VSO (2008) report on the motivation and morale of Ethiopian teachers, by means of questionnaires, focus group discussions and interviews, indicated that inadequate salaries were mentioned by the majority of the participants. Their low salaries were the most significant and most-often mentioned cause of de-motivation and low morale (VSO, 2008:9, 28). One secondary school teacher reported that the salary a teacher was paid was not enough to support a family. This was confirmed in a study by Wole (2002), namely that a low or inadequate salary was the major source of teacher dissatisfaction in Addis Ababa secondary schools. It was more difficult for teachers in urban schools (e.g., in Addis Ababa) who had to cope with high accommodation and transport costs.

Higgins, Hall, Wall, Woolner, and McCaughey (2005) analyzed twenty-five years of research. Higgins et al. found that most researchers supported the fact that there was a relationship between school quality and student performance. Uline and Tschannen-Moran (2005) examined school climate as the link between school facilities and student achievement. Uline and Tschannen-Moran found positive correlation between a school facility’s condition, school climate, and student achievement.

Caddick (2006) presented a paper on the behalf of the National Education Association to the U. S. House of Representatives Committee on Education and Labor that discussed the relationship between school building adequacy and student achievement. Caddick findings indicated that quality facilities were related to all of the school climate variables: teacher professionalism, collegial leadership, community engagement, and academic press.
**McGowen (2007)** investigated the relationship between educational environments facility conditions and school outcomes (student academic achievement, attendance, discipline, completion rate, and teacher turnover rate). McGowen found that student achievement, attendance, and completion rate measure, was not statistically significant in relation to school facility conditions, and discipline or behavior were significantly related to school facility conditions. Teacher turnover rate was related to school facility conditions.

**Cash (1993)** investigated the relationship between school building conditions, student behavior, and student achievement in rural high schools in Virginia. Cash found significant differences between the achievement scores of students in substandard buildings than those above-standard buildings. Cash found that a larger number of differences in scores of students when cosmetic features of a building were used as a measure of comparison (National Research Council of the National Academies, 2006).

**Bowers and Burkett (1988)** investigated the differences in health, attendance, behavior, and achievement in rural Tennessee. Bowers and Burkett found that there was a relationship between the physical environment and health, attendance, behavior, and student achievement. Phillip (1997) also found that there was a definite relationship between age of the school facility and students’ reading achievement scores.

According to the Organization for Economic Co-operation and Development (2000), research had demonstrated that there was a relationship between student performance (achievement and behavior) and the condition of the built environment. School personnel as well as school board members can improve the educational opportunities of their students by insuring that buildings are in good condition and to provide the best possible learning environment that influences the educational opportunities of all students under their charge.

**Lackney and Chang (1992)** concluded that Studying building conditions and educational adequacy within the context of historical change in the school districts’ referendums and building programs, provides unique opportunities to understand how and why improving facilities conditions and educational adequacy across the district
may influence outcomes and may provide more substantial and robust evidence for the relationship between school building condition and learning in the district.

According to Lackney and Picus (2008), educational environments facilities should be responsive to the changing programs of educational delivery. School facilities should provide an environment that was safe, secure, comfortable, accessible, well-ventilated, well-illuminated, aesthetically pleasing, and should be an integral component of the conditions of learning. School Facilities and Student Performance and Achievement and technology, Stallings found that the work environment and the availability of resources did impact the job satisfaction of teachers and that teachers’ work environment might be associated with their decisions to remain in teaching.

Bishop (2009) examined three new high schools that opened in the Commonwealth of Virginia between 2006 and 2007. Bishop investigated the relationship between the new high schools and student satisfaction and staff attitudes and behaviors. Bishop found that improved student behaviors, improved staff and student morale, and a lack of belief that the new buildings more positively impacted student achievement than the old buildings.

Gravelle (1998) has investigated the relationship between student academic achievement and the conditions of the school buildings. She also considered the cost per pupil, school district size, and dropout rate to further investigate the strength of the relationship between school building conditions and student achievement. The study population was the sixth, eighth, and eleventh grade classes of 104 public school districts in the 1992-1993 school years in Idaho. Gravelle used the raw scores of two types of tests to determine student academic achievement: Raw scores on the Iowa Tests of Basic Skills (ITBS) for the sixth and eighth grades and raw scores on the Tests of Achievement and Proficiency (TAP) for the eleventh grade. The unadjusted scores of the Building Condition and Suitability Evaluation assessed school building conditions. The results from the sixth grade class show that there was a significant positive relationship between student achievement and expenditure per pupil. This suggests that money invested in education is a wise investment and that funds spent to ensure a quality education are evidently
worthwhile, particularly at the elementary level. From the eleventh grade, there were no relationships between student achievement and school building conditions, cost per pupil, school district size, or dropout rate. Thus, Gravelle’s findings regarding the relationship between the building condition and student achievement substantiate those of Cash (1993), who also found that structural building conditions did not influence student achievement. Because variances and correlations were relatively small, it can be concluded that the findings concerning the relationships between student achievement and school building conditions, cost per pupil, school district size, and dropout rate from the sixth, eighth, and eleventh grades were inconclusive.

According to Cervantes (1999), the relationship between the school building condition and academic achievement and behavior of students who are enrolled in fourth, seventh, and eleventh grades in selected Alabama public schools. These school facilities were evaluated by using the Guide for School Facility Appraisal Instrument prepared by Hawkins and Lilley (1992). This instrument contains six major areas: school site, structural and mechanical, plant maintainability, school building safety and security, educational adequacy, environment for education, and overall building condition. In general, this instrument includes some architectural and building features that do not directly relate to student achievement. Cervantes’ study sample included 19 schools: eight unit schools (K-12), four elementary schools (K-5), two middle schools (6-8), and five high schools (9-12). He used the Stanford Achievement Test (9th Ed.) Reading and math scores to measure student academic achievement and the disciplinary suspension rates at these schools to measure student behavior. Cervantes analyzed the achievement scores and suspension rates and established any possible relationship between the total building condition rating and the six major building categories with the Pearson correlation statistical procedure. The findings in the unit schools indicated that there is a negative relationship between reading achievement and the school building category of environment for education. The findings in these four studies support what has been found in previous studies, particularly that the failure to control ventilation, temperature, and cleanliness sabotages the facility’s ability to provide an environment conducive to student learning.
According to a Virginia study, Cash (1993) developed research that examined the impact of various factors of building condition on student achievement in a manner that controlled for socio-economic status of the students. Cash (1993) found that when socio-economic factors were constant, facility condition had a significant correlation with student achievement. Specifically, Cash (1993) found that air conditioning, absence of graffiti, condition of science laboratories, locker accommodations, condition of classroom furniture, wall color and acoustic levels correlated with student achievement at a significant level when controlling for socio-economic status of students.

According to Chan (1996) conducted a similar study of the impact of physical environment on student success and satisfaction. This study classified 165 Georgia schools into one of three categories: Modern Learning, Obsolete Learning, or Half Modern Learning Environment. Other than building age, differences in the three categories included lighting, color schemes, air control and acoustic levels (Chan, 1996). As one might expect, Chan (1996) found student achievement to be highest in Modern Learning Environments and lowest in Obsolete Learning Environments. Chan (1996) concluded those technologies and adaptabilities of modern environments better equipped students for success and that to ignore that fact was to disregard the physical difficulties of learning.

According to (Dewees, 1999), facility age is a common discrepancy of building condition that is studied in correlation with student achievement and satisfaction. Bowers and Burkett (1989) studied differences in achievement between secondary students in two buildings, one built in 1939 and one built in 1983. In this study, all other building variables were consistent between the two schools. Bowers and Burkett’s (1989) study revealed that the students in the modern building scored significantly higher in reading, language and mathematics than their counterparts in the older building. The age of a building can influence many of the individual factors used in evaluating the condition of an educational facility (Earthman & Lemasters, 1996).

Earthman and Lemasters (1996) noted that in each case of their study, age of the building had significant impact on student achievement and behavior. Furthermore,
The study indicated that age was a surrogate for other variables of building condition such as lighting, temperature control, proper lighting, sound control, support facilities, laboratory condition and aesthetic values (Earthman & Lemasters, 1996).

The correlation between building age and student achievement has been found to be significant in Texas studies. O’Neill and Oates (2001) report that building age had the highest correlation with student achievement of all building factors investigated in a 1999 study of middle schools in Central Texas. The study indicated that the strongest relationship between building age and student achievement existed in the area of eighth grade students passing reading. O’Neill and Oates (2001) found this correlation to be consistent with numerous other studies that linked building age with factors establishing student achievement, such as the research conducted by Bower and Burkett (1989).

According to Kennedy (2003a) notes that educators have been battling this disconnectedness that seems more prevalent at larger universities and schools. Smaller educational environments have shown a greater capacity to develop personal connections among students and staffs that tend to prevent violent or antisocial behavior (Yaunches, 2002).

An issue related to school size is the ability for students and staff to establish personal links with one another and with the physical educational environment. This notion has been adopted by school designers as they design entire campuses or as they lay out classroom plans that allow for small-group or individualized instruction (Cook, 2002). Bryk (1994) found that students in smaller learning environments achieved at higher levels than their cohorts in larger schools. This University of Chicago study (Bryk, 1994) supported suggestions that smaller high schools not only provided a safer environment than their large counterparts but they also promoted advanced academic achievement. In an examination of hundreds of such studies, the Educational Research Information Clearinghouse commissioned a report that supported the assumption that smaller schools provide more attention to and support for individual student success (Raywid, 1999).

Despite the wealth of research espousing the benefit of smaller schools, statistics indicate that districts continue to erect larger campuses (Viadero, 2001).
Education Week reports that a majority of our nation’s students attend schools with enrollments of 750 or more, while seven states report average high school sizes of more than 1,000 students (Viadero, 2001).

Hofstra University’s Mary Anne Raywid (1999) reports that educational leaders continue to ignore the impact of school size on student achievement. Raywid (1999) suggests that policy makers and scholars have turned a deaf ear to the debate of school size, favoring a focus on curriculum and pedagogy. This trend seems to follow suit with parents and teachers. A recent New York City survey indicates that less than half of teachers and parents would favor dividing large high schools into those with enrollments of less than 500 (Viadero, 2001).

Under the Clinton Administration, the United States Department of Education established the Smaller Learning Communities program with $45 million in grants for program participants. Arguments other than cost efficiency exist in reluctance to build smaller schools. Some of this resistance finds its roots in more affluent communities, where research indicates that the link between school size and student achievement is not as strong (Howley & Bickel, 2002). Support for larger schools is also based upon the premise of student choice. Proponents of large schools, especially large high schools, base their position upon the assumption that larger schools provide a wide range of curricular choices such as advanced classes and fine arts (Viadero, 2001).

According to Stricherz, 2000, in Education Week article, notes that a Florida study found that 96 teaching days were lost in Virginia schools in 1998 due to poor building conditions complicated by age. The Virginia study found that half of the teaching days lost was due to air conditioning failures. Older buildings have been found to actually cause the loss of instructional time.

According to Ruck, 1989 the relationship between light and educational satisfaction, a growing list of studies is finding a relationship between classroom lighting and academic achievement and satisfaction. Students and teachers reactions, motivations, moods and sense of well-being are greatly impacted from the illumination of our surrounding environment (Ruck, 1989). Ruck (1989) noted that the issue of illumination has driven building design for centuries as evidenced by ancient architecture and its attention to natural lighting. Differing degrees of
illumination, namely natural lighting, can be used to stimulate productivity and increase creativity in offices and schools (Ruck, 1989).

An Orange County, California study showed a significant correlation between natural lighting and student success (Hale, 2002). Hale (2002) reports that students in the Capistrano Unified School District with natural lighting provided by windows or skylights scored 19 to 26 points higher on standardized tests than their cohorts with little or no natural lighting in their classrooms. This study (Hale, 2002) does not clearly assign whether the improvement in student performance was due to increased light, quality of light or the physiological effect of natural lighting.

According to Lackney (1994) found that windowless spaces contribute to negative attitudes on the part of students and teachers. Natural lighting, or daylight, has shown to be effective in improving the quality and quantity of lighting in instructional areas. Daylight has been and is still the standard by which artificial light is measured (Fielding, 2000). Fielding (2000) reports that studies by Kuller and Lindsten (1992) and the Heschong Mahone Group (1999), indicate a positive correlation between day lighting and academic performance. In Texas, districts have realized the academic benefit of natural lighting. The Austin Independent educational environment District initiated a lighting program that increased natural lighting in instructional areas in order to increase student comfort, which would likely improve academic performance across all subject areas (Clanton, 1999).

Rydeen (2003) notes that architects who design healthy educational environments for students and teachers that address the aforementioned concerns decrease distractions and allow students and staff to focus on the learning process. Buildings must not only be designed to be healthy. Districts must also maintain their facilities in an effective manner in order to provide a healthy learning environment (Kennedy, 2003a). For example, poorly maintained roofs may leak allowing moisture to enter the building and increase the growth conditions for mold. The presence of mold could cause respiratory problems for students and teachers or even lead to the closure of the classroom or entire building (Kennedy, 2003b).

According to Colgan, 2003 mold and other indoor air quality issues have become the most common concern of designers and administrators in dealing with building
health. Issues regarding indoor air quality are increasingly challenging school board members and administrators across the nation (Colgan, 2003b). Colgan (2003b) notes that older schools are more susceptible to mold and indoor air quality problems, but warns that newer buildings are not immune from these effects. In previous decades, the concern over building health was focused on antiquated building materials such as asbestos and lead-based paints. Laws and policies have now been established to protect students from exposure to these items. These laws have had a profound impact on how schools are built and maintained (Centifonti & Gerber, 1997).

According to study of Lewis, 2001 facility conditions other than indoor air quality have been found to influence student attendance and satisfaction. A study of 139 Milwaukee public schools showed that, when controlled for socioeconomic status, students’ attendance and achievement were positively correlated to facility quality (Lewis, 2001). A portion of this impact can be greatly attributed to the influence that school size has upon student attendance.

Education author Bracey (2001) notes that an abundance of research corroborates the belief that smaller high schools will improve attendance rates. Research in Oregon found better attendance rates in high schools with enrollments between 600 and 900 students (McComb, 2000). McComb (2000) writes that the benefits to attendance do not continue as enrollment dips below 500 students. Increasing school size was seen as a method of enhancing curriculum offerings while lower per pupil costs. However, the benefits of larger schools have not been realized for many students, especially those from low-income families (Howley, 1994).

Along with school size, the age of educational facilities can also contribute to attendance rates. Bowers and Burkett (1989) compared schools with ages differing by years. The study found that students in the modern educational environments had favorable attendance data when compared to the students in the older facility. In a study of Texas middle schools, building age had the highest correlation with student variables including student attendance (O’Neill & Oates, 2001).
The illumination of classrooms has also been found to have an impact on attendance as well as achievement. The **Alberta Department of Education** conducted research that compared children in classrooms with some natural lighting to those attending class with typical electric lighting. This study indicated that students who study under full-spectrum lighting attended school three days more per year than students attending schools in buildings with other lighting (Rouk, 1997). Higher levels of daylight illumination has been found to increase initiative and, in turn, raise motivation for attendance (Ruck, 1989). Schools have realized financial benefits parallel with the academic benefit of improved attendance through the enhancement of classroom lighting. Not only are modern lighting systems utilizing daylight more energy efficient. Schools participating in energy performance contracting have found that, by improving classroom lighting, attendance rates have risen leading to increased state funding (Birr, 2000). Viadero (1990) notes that teachers with higher job satisfaction do a better job of educating students. Other factors of teacher space contribute to the sense of professionalism among faculty. Teachers need space to engage other teachers. Outside of class time, teachers need adult interaction that takes place in pleasant and appealing places (Stenzler, 1988). Teachers need space to interact professionally and socially, according to Hawkins and Overbaugh (1988). Lack of such space for relaxation and planning is a cause for poor morale among faculty members. Job satisfaction is a common factor influencing teacher absenteeism and turnover rate (Keller, 2003). Good physical working conditions in any occupation can have a positive impact upon job satisfaction, attendance, effort, effectiveness and morale (Becker, 1981). According to Keller (2003), it is difficult to separate behavior from work environment when addressing teacher morale and job satisfaction. Physical surroundings impact job satisfaction and, hence, job performance. Decreases in job performance and increases in turnover rate result in real financial cost on the part of school districts as a result of inadequate facilities (Becker, 1981). Becker (1981) notes that adequate space with comfortable temperature; furnishings and lighting will increase the satisfaction of occupants and increase individual capabilities
as a result. Teacher retention is critical to the success of educational reform, as reform is a long-range project (Reeves, 2002).

Studies, such as that conducted by O’Neill (2000) in Texas middle schools, indicate that teacher satisfaction with physical working conditions is positively correlated with student academic performance. The writings of Ma and MacMillan (1999) corroborate the findings of O’Neill (2000) in that they found a significant connection between workplace conditions and teacher job satisfaction. Just as teachers have been involved in the instructional and management decisions of their schools, campus designers have begun to find success in the inclusion of teaching personnel in the design process. One aspect of school design where teacher input is critical is that of teacher workspace (Strange, 2001). Teachers must be given an opportunity to assess their working environment, both the classroom and support areas (Long, 2000).

Teaching methods vary, depending upon content area, student age, demographics and technology available. Teaching strategies of the staff should be taken into consideration by school architects when determining the plan of new or renovated facilities (Sanoff, 1996).

Stanard (1996) suggests that teachers are best prepared to interject the educational needs of students into consideration during the facility design process. Allowing teachers to participate in facility design along with consideration of teachers by facility designers is not only critical to staff morale and retention; it has been shown to have a significant impact upon teacher performance (Christopher, 1991).

Factors, such as working conditions, which improve teacher job satisfaction, have been found to have a direct impact upon school effectiveness (O’Neill, 2000). Fisher and Grady (1998) found that poor facility conditions were a profound factor in teacher job dissatisfaction.

According to Stockard and Mayberry (1992) that the physical environment has been shown to play a significant role in teacher effectiveness. In a study of five urban school districts, the facility conditions were found to be deplorable and the researchers reported a negative effect on teacher effectiveness (Corcoran, 1988). Teachers agree that the facilities in which they teach can deter from the quality of their performance if the physical environment is substandard (Schneider 2003).
Additionally, Mertler (2002:44) indicated the existence of satisfaction and motivation problems in the teaching profession and the effect of less job satisfaction on student’s achievements.

Research had shown that there was an explicit relationship between the physical characteristics of school buildings and educational outcomes (Lyons, 2001). School facilities and the classroom must be flexible enough to accommodate changing learning patterns and methods.

According to the Tennessee Advisory Commission on Intergovernmental Relations: Staff Information Report ([TACR], 2003), reported that there was growing evidence of a correlation between the adequacy of a school facility and student behavior, satisfaction and performance. Research studies that were conducted in the past three decades found that there was significant relationship between the condition of a school, or classroom, and student achievement (Berner, 1993; Cash, 1993; Earthman, 1995; Hines, 1996; Lanham, 1999). Educators and policymakers should be concerned about the relationship between student learning and achievement and school facilities (TACR, 2003). Educators and policymakers must also be concerned about the health, security, and psychological issues (TACR, 2003).

According to Buckley, Schneider, and Shang (2004a) had pointed out that the Los Angeles Unified School District schools must comply with health and safety regulations and academic performance. Buckley et al. (2004a) also noted that a good school facility supports the educational enterprise. Research had shown that good light, clean air and small, quiet, comfortable, and safe environment were very important for academic achievement (Buckley et al., 2004a; Earthman and Lemasters, 1996; Lackney, 1999a; Schneider, 2002).

According to Chan (1996), the learning environment had a direct and an indirect impact on student achievement. Direct impact included: color, lighting, controlled acoustics, and air ventilation (Chan). A good learning environment freed students from physical distress, made it easy for students to concentrate on schoolwork and, induced students in logical thinking. According to Chan, students responded to good and poor learning environments by expressing positive and negative attitudes. With a positive attitude towards their learning environment, students learned with high
motivation and undoubtedly were able to demonstrate better performance. When educators disregard the improvement of learning environment, they ignored the physical difficulties of learning (Chan).

Frazier (1993) indicated that people were influenced and affected by their environment. Therefore, there were no exceptions to children being exposed to the environmental conditions in school facilities (Frazier, 1993). Deferred maintenance on school facilities could cause adverse problems and create an environment that affected the health and morale of the students and the staff of the school (Frazier, 1993).

Research studies of Anderson (1999), Berner (1993), Cash (1993), Earthman (1998), Earthman (2002), Hines (1996), and O’Neill (2000) had provided support for research that found that the condition of the school building had a sizeable and measurable influence upon the achievement of students. There was a growing research literature that had held the belief that there was a relationship between student achievement and the condition of school buildings (Hunter, 2006). The United States Department of Education (2000) found that the environmental conditions in schools, which included the inoperative heating system, inadequate ventilation, and poor lighting, affected the health and learning as well as the morale of students and the staff. Other research studies and literature had focused on lack of science labs, school safety, and class size (Hunter).

**Lighting Quality and effects on student’s and teacher’s satisfaction**

According to Jago and Tanner contended that visual environment affected a learner’s ability to perceive visual stimuli and affected his or her mental attitude, and thus performance. Hughes (2005) contended that lighting in a school could have a great impact on what students were able to see in the classrooms. Natural light was one type of light that influenced peoples’ minds and bodies (Hughes, 1999; Lyons, 2001). The Hesohnong Mahone Group (1999) reported that natural light affected learning positively.

Students could not study unless the lighting in the classroom was adequate (Schneider, 2002). Research studies pertaining to school facilities, student
achievement, and student behavior found that daylight fostered higher student achievement (Lemasters, 1997; Schneider, 2002).

Heschong Mahone Group (1999) did a study covering over 2000 classrooms in three school districts dealing with the effects of daylight on human performance. The Heschong Mahone Group found that students with the most daylight in the classroom progressed 20% faster on mathematics test in one year and 26% faster on reading tests than those students who had learned in classrooms that received the least amount of natural light (Plympton, Conway & Epstein, 2000; Schneider, 2002).

According to Schneider (2002), natural light in school buildings was the predominant means of illuminating most school spaces until the 1950s. After the 1950s, as electric power costs declined, so did the amount of daylight used in schools (Schneider, 2002). Recent studies showed that day lighting in schools significantly increased students’ test scores and promoted better health and physical development—and could be attained without an increase in school construction or maintenance costs (Plympton et al.).

Color Quality

Chan (1996) believed that the use of color in classrooms stimulate thinking, especially pastel colors. Green and blues were more peaceful colors and red and orange colors tended to provoke actions (Chan). Pile (1997) reported that classrooms needed colors that were comfortable for students.

Jago and Tanner (1999) suggested that color choices impacted the teaching and learning process. Sinofsky and Knirck (1981) found that color influenced behaviors, learning, and student attitudes. Color affected a student’s attention span and affected the student and teacher’s sense of time (Jago & Tanner). Kowalski (2002) indicated that color schemes complement light by improving sight conditions, and provided aesthetic qualities to space. “When acting together, color and light could stimulate, relax, and provide expression of warmth. Visual outputs in a school building can include both natural and artificial lighting” (Kowalski, 2002).

Brady (2004) noted that color had everything to do with school facilities. Research studies had found that color affected every student – from their mood to their appetite (Brady; Sinofsky & Knirck, 1981).
Indoor Air Quality

There was growing research that linked student performance and achievement to the quality of air that students breathed in schools (Energy Star, 2003; Environmental Protection Agency [EPA], 2000; Fischer & Bayer, 2003; Kennedy 2001; Leach, 1997; Schneider, 2002). The GAO (1995) found that there were 15,000 schools that suffered from poor indoor air quality, which affected more than 8 million children in schools today. The EPA (2000) (as cited in Schneider (2002) identified symptoms that included irritated eyes, nose and throat, upper respiratory infections, nausea, dizziness, headaches and fatigue, or sleepiness.

The American Lung Association ([ALA], 2002) found that children in American schools missed more than 10 million school days each year because of asthma caused by poor indoor air quality in schools. Shaughnessy (2008) reported that 20% of the American population spent their days inside K-12 school buildings. There were only a few students and teachers who realized that the air within the building could adversely affect both their learning potential as well as their health. The GAO (1995) reported that almost half the nations’ schools had poor indoor air quality.

Olson and Kellum (2003) suggested that indoor air quality had direct effects on student performance. Research had shown that better indoor air quality in schools had resulted in healthier students and teachers, which had led to less absenteeism and improved student achievement (EPA, 2000; Olson & Kellum, 2003). Further, they maintain that good indoor air is important if teachers and students continue to spend significant amounts of time in the classroom.

Frazier (1993) concluded that the most alarming to school-age children was the effect of poor indoor air quality. Frazier (1993) pointed that the quality of air that was found inside public school facilities had a significantly effect on student’s ability to concentrate.

Andrews and Neuroth (1988) also asserted that there was evidence that suggested that youth, who were under the age of 10 years old, were more vulnerable than the adults to the types of contaminants (asbestos, radon, and formaldehyde) found in school facilities.
According to EPA (2003), educational environments, universities, colleges, and schools should be designed, built, and maintained in ways to minimize and control sources of pollution, provide adequate exhaust and outdoor air ventilation by natural and mechanical means, maintain proper temperature and humidity conditions, and were responsive to students and staff with particular sensitivities such as allergies or asthma. Failure to deal adequately with any of these issues could go unnoticed, but could and often does take its toll on health, comfort, and performance of teachers and students in school (EPA, 2003).

**Temperature, Humidity, and Thermal Quality**

Schneider (2002) showed that temperature and humidity affected indoor air quality. Indoor air quality promoted or inhibited the presence of bacteria and mold (Schneider, 2002).

Wyon (2000) studies had shown that student performance at mental tasks was affected by changes in temperature.

Harner (1974) found that the best temperature range for reading and math was 68 to 74 degrees Fahrenheit. The students’ ability to learn the reading and math was adversely affected when the temperature above 74 degrees Fahrenheit. As the temperature and humidity increased, students’ discomfort increased, and their achievement and task-performance deteriorated as attention spans decreased (King & Marans, 1979; Schneider, 2002).

According to Earthman (2002), good thermal environment of a classroom was very important to efficient student satisfaction and performance. Research in the past had shown that increases in temperatures in the workplace tended to decrease worker efficiency and increased the risk of work related accidents.

Harner (1964), Mayo (1955), and Nolan (1960) concluded that the importance of a controlled thermal environment was stressed as necessary for satisfactory student performance. In spite of the age of all of these research studies, these findings were just as germane today as they were a century ago (Earthman, 2002).

**Acoustic Quality**

According to Earthman (2002), proper and accurate hearing in the classroom was essential to a student’s ability to learn. Research dates as far back as Morgan
(1917) that noise was a distraction that interfered with learning and that students learn more when the classroom noise level is reduced to 40 decibels” (Earthman, 2002, p. 4).

According to McGuffey (1982), Hyatt (1982), and Duffy (1992) there was a relationship between acoustic conditions, student health, and student achievement. Further, according to Earthman (2002), “The ability to clearly hear and understand what is being spoken is a prerequisite for effective learning. When this ability is impaired through unwanted noise, students do not perform well”.

School Size

According to McGowen studies, 2007 as enrollment numbers climbed, the issue of school size became relevant to the task of improving student performance (McGowen, 2007). After the tragedy at Columbine disaster in 1999, there was plenty of blame to go around (Kennedy, 2003). The investigation of the tragedy found that there were many signs of potential trouble if the authorities at the school had known the students well enough to detect their paths (Kennedy, 2003). Because of the large enrollment at Columbine, 1,870 students, teachers and administrators were unable to detect the potential trouble, and the inability to know a student and how he or she was coping with school life (Kennedy, 2003, p. 20).

According to Kennedy, 2003, Small learning environments led to better student performance as well as created environments with fewer incidents of vandalism, violence, or other misbehavior. According to WestEd (2001), recent school shootings had intensified concerns that many students got lost in large, impersonal schools and some become tragically alienated. “At the same time, the push for higher achievement and the quest to narrow the achievement gap between poor students — who were often African American and Latino and those from middle- and upper-income families had led to questions about the role school size played in student learning” (WestEd, 2001, p. 1). For years, there had been national trends for larger high schools.

Teacher Retention

Buckley, Schneider, and Shang (2004b) indicated that the quality of school facilities was an important factor in the decision making of individual teachers. “The quality of
school facilities is an important predictor of the retention and attrition decision” (Buckley et al., 2004b, p. 2). According to Buckley et al. (2004b), there were a large number of factors that clearly affect teacher retention, “the physical location (school building), and the quality of the location can affect the ability of teachers to teach, teacher morale, and the very health and safety of teachers” (p. 4).

Schneider (2002) pointed out that school facilities had a direct effect on teaching and learning. Schneider (2003) also found that the poor conditions of school facilities made it difficult for teachers to teach their students or provided an adequate education to their students, which affected teachers’ health and safety. These poor conditions caused teachers to leave their schools and leave the teaching profession. According to EPA, 2000 Schools with good indoor air quality were also likely to have high teacher retention rates and spend less on substitute teachers to replace sick members of the staff. This could improve continuity in school programs and could provide students with higher quality education (EPA, 2003; Olson & Kellum, 2003).

Johnson (2006) concluded that when teachers were successful and sustained in their work, they were likely to remain in teaching. However, schools must provide an array of support. Factors that contributed to the workplaces where teachers hope to achieve success with their students included (a) teaching assignments that match the teacher’s field of expertise; (b) collaborative colleagues; (c) assistance from parents and experts in working with students; (d) support services for students that helped teachers in their work with students, (e) a comprehensive, but flexible curriculum that allowed for meaningful accountability; (f) job-embedded professional development; (g) career opportunities for growth and influence beyond the classroom; and (h) facilities that were safe and well equipped (Johnson, 2006). If teachers felt that their workplaces had failed them, there was a good chance that these teachers would transfer to another school or just left the teaching profession altogether (Johnson). Schools must become places where students and teachers could succeed together, if students were to be effectively educated in order to perform to high standards (Johnson).

Keller (2003) pointed out that teachers were influenced by the physical conditions within they work, just as students’ behaviors and attitudes were impacted by their physical surroundings. Teachers in larger schools had taught in non-instructional
areas such as hallways or closets. A survey commissioned by the National Clearinghouse on Educational Facilities reported that teachers felt that lack of fine arts accommodations, small classrooms, and inadequate lab space were deterrents to their job of educating children and job satisfaction (Schneider, 2003). According to Keller, 2003 Physical surroundings and conditions impacted job satisfaction. When addressing teacher morale and job satisfaction, the work environment played an important role. Teacher morale, job satisfaction, and the work environment could not be separated (Keller, 2003). O’Neill (2000) study in selected Texas middle schools had indicated that teacher satisfaction with physical working conditions was positively correlated with student academic performance. Working conditions improved teacher job satisfaction and directly impacted school effectiveness (O’Neill, 2000). According to Randall, Fedor, and Longenecker (1990), teacher job satisfaction was a multifaceted construct that was critical to school effectiveness, teacher retention as well as teacher commitment.

Earthman (1996), Edwards (1992), Edwards (1996), and Hines (1996) had shown in their research that school climate—orderly, appropriate, and safe educational facilities, which were conducive to teaching and learning, to be determinant of academic achievement. Edwards (1992) investigated the relationship between school building conditions, parental involvement, and student achievement in schools in the Washington, D.C. school system. Edwards (1992) found that building condition had an effect on student achievement.

Rosenholtz and Simpson (1990) analyzed factors that could contribute to the commitment of teachers to the workplace. Rosenholtz and Simpson found that the burden of non-teaching obligations affected the commitment of new teachers much more than it does for experienced teachers. Evidence also showed that school management of student behavior also affected the commitment of new teachers more than the commitment of experienced teachers.

Overbaugh (1990) found that the physical environment affected teachers in their professional performance. Teachers ranked classroom equipment, classroom furnishings, and ambient features as the most important environmental features. The study determined the perceptions of teachers on how school facilities affected their
ability to function as a professional. The study also revealed that teachers were generally satisfied with all of the physical environmental factors of the instructional areas of their schools.

Billingsley (1993) discussed three major factors that influence teacher retention. They were employment factors, external factors, and personal factors. Employment factors were professional qualifications, commitment, and work conditions. External factors were societal institutional and economic variables. Personal factors included the family, demographic, and affective portions of a teacher’s career decision. According to Schneider (2002), poor air quality made teachers as well as students sick. This meant that students and teachers could not perform as well as the healthy students and teachers. Poor indoor air quality had been associated with increased student absenteeism (EPA, 2000; Rosen and Richardson, 1999; Schneider, 2002; Smedje & Norback, 1999).

According to Robbins and green, 2001 a satisfied teaching force leads to higher commitment and productivity because of fewer disruptions, such as absenteeism, the departure of ‘good’ employees, and incidences of destructive behaviour (Robbins, in Green, 2000:1). The presence of satisfied teachers also translates into lower medical and life insurance costs.

According to Arnold and other researchers (in Perrachione, Petersen & Rosser, 2008:26), personal satisfaction, along with professional responsibility, is an important indicator of a person’s psychological well-being, as well as a predictor of work performance and commitment.

In a study by Hongying (2008:11), teacher job satisfaction was found to affect teaching, the effectiveness of educational environments administration, and the quality of the school. Thus, job satisfaction affects the teachers’ work and psychological health and the future of education also.

According a study by Akiri and Ogborugbo, (2009:55). That examined the teachers’ satisfaction with their careers in public secondary schools in Nigeria found that the majority of the teachers (about 72%), were generally dissatisfied with their salaries. The researchers also indicated that the rate of increase in the teachers’ salaries and allowances was low in comparison to the rate of inflation in the country. In addition,
the they were poor when compared with those of workers in the private sector. The employees’ perceptions of inequity with respect to salary may result in dissatisfaction (Kim, 2005:668). This is explained by Adam’s Equity Theory, as seen in section 2.2.4.

According to Kim, 2005:668, the low and unfair teacher salaries increasingly make conditions difficult to fulfill in their basic needs, and to cope with their financial obligations and the expectations from their families. Hence the teachers become frustrated, and therefore dissatisfied with their careers.

In a paper entitled ‘The wrong solution to teacher shortage’, Ingersoll and Smith (2003:32), pointed out that about 29% of the sample’s participants indicated dissatisfaction with teaching as a career. More than three-quarters (75%) of the teachers who quit teaching because of their dissatisfaction with their jobs mentioned their low salaries as the main cause (Ingersoll & Smith, 2003).

Gates and Mtika (2011:430), after interviewing secondary school trainee teachers in Malawi on their profession, observed that trainee teachers perceived the teachers’ salaries as low, with no other incentives. The trainee teachers argued that the teachers’ low salaries and the lack of incentives would cause teachers to become engaged in other income-generating activities, which may limit their commitment to their schools. Moreover, it would lead to absenteeism, and would motivate teachers to leave the profession. The perceived low salary also affected the professional status of teaching within that community (Gates & Mtika, 2011).

Bolin (2007:59), in a study on teacher job satisfaction and factors that influence it, examined five dimensions that could possibly lead to job satisfaction, namely self-fulfillment, workload, salary, leadership and collegial relationships. The researcher’s finding showed that teacher satisfaction was low with regard to the income dimension. In other words, teachers were not satisfied with their income. The study revealed that a high work demand and low salaries could lead to the lack of job satisfaction.

According to Herzberg, et al. (1959), administrative support is viewed as a hygiene or extrinsic factor that could influence employees’ job satisfaction. Administrative support is considered to be one of the working conditions which could have a
profound effect on the job satisfaction of teachers. In their study of administrative support and its mediating effect on US public school teachers, Chang, et al. (2010:5-6) demonstrated that administrative support was found to be the most significant and a strong predictor of the teachers’ job satisfaction, more so than other variables (teaching experience, student behaviour, and teachers’ salaries), which were included in the study. They also found that administrative support had much power, directly and indirectly (through job satisfaction), to predict the teachers’ intent to stay in the profession.

According a study by Ingersoll and Smith (2003:32) indicated that teachers who were dissatisfied with their jobs often identified a lack of administrative support (34.9%) as a primary cause. This finding was supported by Wright and Custer (1998:62), namely that administrative support was the least satisfying aspect of their work for the teachers in their sample.

According to Lehman and Stockard (2004:762), administrators seem to influence the teachers’ job satisfaction indirectly. They argue that by promoting a safe and orderly university, by assigning teachers to positions for which they are qualified, by providing teachers with a sense of control and influence over their work, and by providing a context in which teachers can feel supported by their colleagues and the students’ parents, and where they can be more efficacious in their teaching, school administrators positively influenced teachers’ job satisfaction.

Ma and McMillan (1999:46) found that administrative control was the most important workplace condition positively affecting the teachers’ satisfaction. The teachers’ positive perceptions of their relationships with the school administration were able to narrow substantially the satisfaction gap among teachers with different years of teaching experience.

A positive relationship between the students and the teachers is not only of significance for the students and for the educational outcomes of any educational system, but also for the job satisfaction of the teachers. Butt and Lance (2005:407) reinforce this by stating that the teachers themselves value the relationships they form with the students very highly. This is because teacher-student relationships were found to be important to the teachers.
In a study by Shann (1998) it was reported that the teachers were more satisfied with this aspect of their jobs than with any other aspect. Garrett and Hean (2001) indicated that teachers reported high satisfaction with all relationships they had within the school community in general, but with students in particular. Hendriks, Scheerens and Van Amelsvoort (2000:17-18) argued that the teachers are losing their confidence in the profession, and are suffering from diminished job satisfaction which, in turn, causes decreased commitment. This situation does not only affect the quality of teaching and learning, but even the adequacy of teacher supply, and therefore the quality of education in the long run.

Lackney (1999a) argued that school buildings were critical to the teaching and learning process. Lackney also took the viewpoint that “the factors responsible for student achievement were ecological – they acted together as a whole in shaping the context within which learning took place. The physical setting – the school building was an undeniably integral part of the ecological context for learning”. The physical factors that had a profound impact on the teaching and learning process were (a) full-spectrum and natural lighting, (b) the reduction and control of noise, (c) the location and sighting of schools, (d) optimal thermal conditions, (e) school size and class size, and (f) the building condition (Lackney, 1999a).

2.5 CONCLUSION

After reviewing several literature and researches relevant to current study it is found that:

- The studies were conducted in the field of psychology, education, engineering, ergonomic and sociology.

- The studies have varied objectives design and theme which drawing out different result. Majority of studies pertaining to survey method.
A large number of studies have investigated the negative and positive effect of educational environment standards on educational satisfaction, academic welfare, student’s and teacher’s achievements, student’s and teacher’s motivations.

In summary there are various research studies which are explicitly and implicitly relevant to this study. These research studies vary in objectives, research methodology, procedure of data collection, tools of data collection and analyzing. There is not any study approximate to the objectives and methodology which conducted in this study and in same geographical region and there is not any research about Indian and Iranian educational environment to evaluated the educational satisfaction between both countries students and teachers.

The next chapter focuses on the methodology that has been applied to collect empirical data in order to evaluate educational environment and educational satisfaction.

CHAPTER III

PLAN AND PROCEDURE

3.1. INTRODUCTION