Teaching methods and school designs of American elementary schools and how the methods are reflected in the schools' designs

Merrill Eugene Kieffer

University of Nevada, Las Vegas

Follow this and additional works at: https://digitalscholarship.unlv.edu/rtds

Repository Citation

Kieffer, Merrill Eugene, "Teaching methods and school designs of American elementary schools and how the methods are reflected in the schools' designs" (1998). UNLV Retrospective Theses & Dissertations. 889.
https://digitalscholarship.unlv.edu/rtds/889

This Thesis is brought to you for free and open access by Digital Scholarship@UNLV. It has been accepted for inclusion in UNLV Retrospective Theses & Dissertations by an authorized administrator of Digital Scholarship@UNLV. For more information, please contact digitalscholarship@unlv.edu.
INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6” x 9” black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor MI 48106-1346 USA
313/761-4700 800/521-0600

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
TEACHING METHODS AND SCHOOL DESIGNS OF AMERICAN ELEMENTARY SCHOOLS AND HOW THE METHODS ARE REFLECTED IN THE SCHOOLS' DESIGNS

by

Merrill Kieffer

Bachelor of Science
University of Nevada, Las Vegas
1992

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Architecture

School of Architecture
University of Nevada, Las Vegas
August 1998
The Thesis prepared by

Merrill E. Kieffer

Entitled

Teaching Methods and School Designs of American Elementary Schools and How the Methods Are Reflected in the School's Designs

is approved in partial fulfillment of the requirements for the degree of

Master of Architecture

Examination Committee Chair

Dean of the Graduate College

Examination Committee Member

Examination Committee Member

Graduate College Faculty Representative
ABSTRACT

Teaching Methods and School Designs of American Elementary Schools and How the Methods are Reflected in the Schools' Designs

by

Merrill Kieffer

Attila Lawrence, Examination Committee Chair
Professor of Architecture
University of Nevada, Las Vegas

Most educators agree that effective learning is preceded by effective teaching and that the school facility should provide an environment in which the pursuit of knowledge can be promoted. This study was competed to understand that relationship between the built environment and education.

The research presents a review of some of the prominent learning theories of the twentieth century along with common teaching methods and their relationships to learning theory. Following this review, common school designs are analyzed based on the overall environmental needs identified through the study of learning theory and educational practices. Furthermore, the microenvironment of the classroom is analyzed based on prior studies.
A determination is presented regarding classroom size (both by student numbers and square footage allotments), shape, amenities (seating, windows, and study spaces) and the usage of interior/exterior space. Finally, a review of the best school plan types for the Las Vegas region is presented.
# TABLE OF CONTENTS

ABSTRACT ............................................................................................................. iii

LIST OF FIGURES .................................................................................................. vii

LIST OF TABLES ...................................................................................................... ix

CHAPTER 1  INTRODUCTION ................................................................................ 1  
  Statement of Problem .................................................................................... 4  
  Study Objectives ............................................................................................. 5  
  Organization of Study ..................................................................................... 5  
  Limitations of the Study .................................................................................. 6

CHAPTER 2  LEARNING THEORIES ...................................................................... 7  
  Behaviorism .................................................................................................... 8  
  Cognitivism ..................................................................................................... 10  
  Situated Learning .......................................................................................... 13  
  Collaborative Learning ................................................................................. 15  
  Constructivism ............................................................................................... 17  
  Summary ....................................................................................................... 19

CHAPTER 3  TEACHING METHODS ................................................................... 21  
  Traditional Teaching ..................................................................................... 22  
  Group Teaching ........................................................................................... 24  
  Open Education ............................................................................................ 26  
  Montessori ..................................................................................................... 29  
  Summary ....................................................................................................... 32

CHAPTER 4  SCHOOL DESIGN ............................................................................ 34  
  Public Schools ............................................................................................... 36  
  School Plan Types ....................................................................................... 39

CHAPTER 5  CLASSROOM ENVIRONMENT ...................................................... 63  
  Classroom Size ............................................................................................. 66  
  Classroom Configuration .............................................................................. 74  
  Seating Arrangement ................................................................................... 79  
  Windows ......................................................................................................... 83  
  Study Spaces .................................................................................................. 86

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>A Model of Classroom Climate Determinates</td>
<td>36</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Open School Plan</td>
<td>40</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Corridor Plan School - Wareham High School</td>
<td>47</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Corridor Plan School – Pleasant Lake Elem. School</td>
<td>48</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Corridor Plan School – Meriwether Lewis Elem. School</td>
<td>49</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Corridor Plan School – Blue Haze Elementary School</td>
<td>50</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Dbl.Corridor Plan School – Sun Valley Elementary School</td>
<td>51</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Dbl.Corridor Plan School – Cherry Tree Elementary School</td>
<td>52</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Dbl.Corridor Plan School – S. Washington County Elem.</td>
<td>53</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Cluster Plan School – Bluffsview and Slate Hill Elem.</td>
<td>54</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Cluster Plan School – Rising Star Elementary School</td>
<td>55</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Courtyard Plan School – Trabuco Mesa Elem. School</td>
<td>56</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Courtyard Plan School – Century High School</td>
<td>57</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Urban Block Plan School – Prototype School</td>
<td>58</td>
</tr>
<tr>
<td>Figure 15</td>
<td>Urban Block Plan School – Stuyvesant High School</td>
<td>59</td>
</tr>
<tr>
<td>Figure 16</td>
<td>Urban Block Plan School – Public School No. 5</td>
<td>60</td>
</tr>
<tr>
<td>Figure 17</td>
<td>Campus Plan School – Centennial High School</td>
<td>61</td>
</tr>
<tr>
<td>Figure 18</td>
<td>Campus Plan School – Pleasanton Middle School</td>
<td>62</td>
</tr>
<tr>
<td>Figure 19</td>
<td>Open Space Forms</td>
<td>75</td>
</tr>
<tr>
<td>Figure 20</td>
<td>Multi-Group Plan 1</td>
<td>76</td>
</tr>
<tr>
<td>Figure 21</td>
<td>Multi-Group Plan 2</td>
<td>77</td>
</tr>
<tr>
<td>Figure 22</td>
<td>Multi-Group Plan 3</td>
<td>78</td>
</tr>
<tr>
<td>Figure 23</td>
<td>Classroom Sight Lines</td>
<td>81</td>
</tr>
<tr>
<td>Figure 24</td>
<td>Space Relationship Diagram</td>
<td>92</td>
</tr>
<tr>
<td>Figure 25</td>
<td>Schematic Site Plan 1</td>
<td>94</td>
</tr>
<tr>
<td>Figure 26</td>
<td>Schematic Site Plan 2</td>
<td>95</td>
</tr>
<tr>
<td>Figure 27</td>
<td>Schematic Site Plan 3</td>
<td>96</td>
</tr>
<tr>
<td>Figure 28</td>
<td>Schematic Site Plan 4</td>
<td>97</td>
</tr>
<tr>
<td>Figure 29</td>
<td>Schematic Classroom Plan 1</td>
<td>100</td>
</tr>
<tr>
<td>Figure 30</td>
<td>Schematic Classroom Plan 2</td>
<td>101</td>
</tr>
<tr>
<td>Figure 31</td>
<td>Schematic Classroom Plan 3</td>
<td>102</td>
</tr>
<tr>
<td>Figure 32</td>
<td>Schematic Classroom Plan 4</td>
<td>103</td>
</tr>
<tr>
<td>Figure 33</td>
<td>Schematic Classroom Elevation 1</td>
<td>104</td>
</tr>
<tr>
<td>Figure 34</td>
<td>Schematic Classroom Elevation 2</td>
<td>105</td>
</tr>
<tr>
<td>Figure 35</td>
<td>Desk Configuration – Social, Collaborative Layout</td>
<td>106</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1  Spatial Environment (Teachers) ........................................................68
Table 2  Spatial Environment (Students) ........................................................68
Table 3  Attitudes of Spatial Environment (Students) .....................................69
Table 4  Attitudes of Spatial Environment (Teachers) ...................................70
Table 5  Luminous Env. vs. Spatial Env. (Students) .......................................73
Table 6  Aural and Luminous Env. vs, Spatial Env. (Students) .......................73
Table 7  Attitudes: Aural Environment (Students) ..........................................73
Table 8  Student Participation in Seminar/Lecture Rooms ............................83
Table 9  Student Participation in Conventional Classroom ...........................85
CHAPTER 1

INTRODUCTION

“Since 1983 reports on education in this country have cited relentlessly grim data. For example, only 4.9 percent of seventeen-year-olds read well enough to understand college-level textbooks. Scholastic Aptitude Test scores fell 68 points from 1967 to 1981, gained back 16 points by 1985, leveled off, and then dropped again in 1988” (Famham-Diggory, 1990, pgs. 1-2). There are probably many reasons for this decline, which may include ineffective classrooms or ineffective teaching methods.

The elementary school classroom has gone through many design changes in the past decades. The typical rectangular room has given way to many shapes. The cause of these changes is partially due to the belief that the space should reflect the teaching methods employed at the school. There is agreement from most parties that a school’s physical plant should mirror its educational philosophy (Sommer, 1969, pg. 98). However, teaching methods continue to be revised or replaced which may result in an environment not equipped to provide the necessary spaces, arrangements or materials. “Many scholars have pointed out the importance of the effects of the man-made surroundings in such buildings as schools; however, a general unawareness of
these effects persists among architects and educators alike" (Artinian, 1970, pg. 2).

The open classroom design of the 1960's, typically confused with open education, failed as a design concept when it involved team teaching. The design did offer flexible classroom space that could be divided and subdivided. However, the open plan hindered the team teaching concept because it proved difficult to schedule similar activities between classes. For example, quiet times needed to be scheduled to occur simultaneously. Therefore, to maintain the pre-planned sessions, activities were sometimes cut short to meet time schedules. If schedules were not met, the loss of student discipline and the increase of student distraction resulted. "Data from achievement test results, comparing open-space schools with traditional schools, indicate that certain students may be unsuited to an open environment, and that this type of environment may encourage negative achievement effects (Sanoff, 1994, pg. 41). Today, the classroom design survives in varied forms. Some of these forms are present in six of the main design themes used in modern schools: the corridor, cluster, double corridor, courtyard, urban block, and campus designs.

Present teaching methods have their origins in the 1920's. Since that time, society has undergone many changes. Most notably is the two-income family. As the number of women in the work place increases, children spend more time away from both parents. Statistics indicate that children, on average, spend 23.3% of a given year with their classmates, 29% with their friends, and 27% alone (Crooks & Stein, 1991, pg.452. Adapted from Csikszentmihalyi and
Larson). Therefore, school has a large effect on a child's developmental years.

Throughout a student's adolescence, the school is the meeting place where he or she is provided with the opportunities to develop educational and social skills. The school itself becomes the central place in the student's learning process (Sebba, 1986, pg. 4).

According to Castaldi, educational psychologists generally agree that the feelings of belonging and security are of major importance in the learning process (Castaldi, 1969, pgs. 108-110). Social activities are important for this reason because group activities help develop a feeling of belonging within an individual. Blair stated that "the child who fails to achieve a place in a society of his peers is not only apt to become an educational casualty but a community problem as well" (Blair, 1962, pg.339). Fred Steele went further and suggested that the physical settings of schools serve six basic functions: security and shelter, social contact, symbolic identification, task instrumentality, pleasure and growth (Castaldi, 1969, pg. 28). The National Association for the Education of Young Children (NAFEYC) believes the best learning environment (both indoor and outdoor) is one that stimulates the child to want to learn, to reach out for new understanding, to inquire about his/her environment and to provide security (NAFEYC, 1973, pg. 12). Epstein and McPartland found that positive reactions to school increase the likelihood that students will stay in school, develop a lasting commitment to learning, and use the institution to their advantage (Epstein, 1975, pg.26).
Statement of Problem

Space is the common denominator between architecture and education. Education requires certain kinds of spaces and equipment to carry out its function. Architecture provides the ways of arranging and enclosing these spaces. Planners must know the aims of the educators and have some idea as to the kinds of spaces and equipment needed to carry out the aims of education in general and a specific philosophy in particular. As society has changed, education must change as well.

This research will study current teaching methods, the classroom and the school environment. Although I will discuss current teaching methods along with some advantages or disadvantages associated with each, this paper is not intended to resolve any educational deficiencies in teaching methods or to determine the best approach. However, I do feel it is important to discuss teaching and learning in conjunction with classroom design in order to understand the effects of each on the other.

In sum, the purpose of this study is to analyze the classroom environment along with common teaching methods and school designs used today, and to determine if a relationship exists between specific physical environments and specific teaching methods. The hypothesis for this study began with the classroom design must reflect the teaching philosophy employed in the classroom to maximize the learning potential in students.
Study Objectives

The objectives of this study are:

- to examine the learning theories used to understand human development,
- to examine common teaching methods used in the United States,
- to examine the school environment in today’s elementary schools, and
- to analyze the relationship between the teaching methods and the school environment.

Organization of Study

This research is divided into six chapters. The first chapter presents the Introduction to the study. The second chapter reviews learning theories: Behaviorism, Cognitivism, Situated, Collaborative and Constructivism. The third chapter reviews teaching methods associated with the learning theories discussed. These teaching methods are: Traditional, Group, Open and Montessori.

Chapter four reviews modern school design and provides plan types for discussion to determine the best design type associated with the Las Vegas region. Chapter five reviews related literature and studies of the classroom environment. Included in the review are: classroom size and configuration, seating arrangements, windows and study spaces.

Chapter six reviews the research and provides the findings of the study in written and diagrammatic form.
Limitations of the Study

Due to the broad nature of the topic, this research was limited to the more common aspects related to elementary school education and elementary school design. The first of the limitations was in the review of learning theories. The theories researched are arguably the most prominent learning theories on human development since the beginning of the twentieth century and have had major impacts on the educational system.

The second limitation of the research was that only public education was reviewed in efforts to limit the number of samples and yet to study a more diverse population base. Within this concept, common teaching methods were reviewed to provide a comparison between public education systems, learning theory and the classroom environment.

Because the design of school facilities is determinant on a multitude of factors, the review of school plan design was limited to common design themes prominent in the United States. Lastly, the school designs recommended in the conclusions of the research were guided by the climatic and geographical concerns of the American southwest region.
CHAPTER 2

LEARNING THEORIES

In order to understand how the learning environment effects the learning process, we must first understand how we learn. This section provides an overview of some of the major human learning and psychological theories that have guided American education.

There are many definitions of learning. It can be described as the retention of knowledge through repetition and recitation or as an interpretative process aimed at understanding reality (Schmeck, 1988, pg. 3). Learning can also be defined as a change in behavior that results from experience. From a physical perspective, "learning is the process whereby the nervous system is transformed by its own activity...neural activity changes the neurons that are active, and that change is the structural basis of learning" (Schmeck, 1988, pg. 4). Whichever definition we choose to employ, the common theme to all the descriptions is a change that takes place in one's mind as something is learned.

Much of today's understandings of the human learning process date back to the late 1800's. William James, James Dewey, and George Herbert Mead took leading roles in the development of functional psychology that dominated American psychology at the turn of the century. The underlying principles of
functional psychology, as stated by Dewey, were interaction within the context of the environment and continuity through growth, either by thought, action, individual development, social change or biological evolution (Phye, 1997, pgs. 14-16). It was these principles that set the stage for today's learning philosophies. Of these, Behaviorism, Cognitivism and, more recently, Situated learning have been the most influential learning philosophies. Behaviorism is best exemplified as a stimulus-response process as defined by Ivan Pavlov and B.F. Skinner. Cognitivism focuses on the cognitive processes of the mind. Situated learning addresses the role of the learner in given situations and the experiences he or she acquires to gain knowledge through that interaction.

**Behaviorism**

Behaviorism was the preeminent psychological theory of learning in America in the early 1900's. Based on the scientific study of behavioral responses to physical stimuli, behaviorism governed much of the field of American learning psychology from the 1920's until the advent of cognitive psychology in the 1960's. During this reign many of today's educational practices were developed.

Learning, as stated above, can be defined as a relatively enduring change in potential behavior that results from experience (Crook, 1991, pg. 225). This change, is believed to occur as a result of classical and operant conditioning. The classical conditioning of dogs by Ivan Pavlov brought to light the
associations of an external stimulus on the involuntary behavioral response of
the learner. Through this conditioning, expected results, or learning, occurs.

Operant conditioning, as viewed by B.F. Skinner, defined learning as a
result of a learner's interaction with its environment. Through continual
experience within an environment, an expected result will occur when a learner
begins to operate in a manner that results in satisfying behavior. Through
reinforcement faster response rates occur that result in learning.

The results of learning through behavioralistic ideals have had major
effects on American education. The traditional classroom teaching approach,
that of the teacher passing information on to students through pre-planned,
conditioned exercises, has been the main-stay of educational practices
throughout most of the 20th century. One concern of modern psychologists is that
behaviorists choose to reduce the learner to a passive subject, taught to react in
predetermined ways without concern for the potential of mindful thought
processes. Phye states that a result of behavioristic teaching is that one learns
the basic skills first. Given this isolation of skills, present learning has no longer-
run value to the learner beyond the context of the immediate experimental
situation. This is because the learner has no idea of the relationship between
this part and what the learner will be asked to learn next to make up some larger
whole (Phye, 1997, pg. 21). In other words, the thought processes, now deemed
to exist through cognitive psychological beliefs, do not typically occur in the
behavioralistic approach to learning.
Educators who practice Behaviorist ideals in the classroom deal with a strict regiment of learning processes. Fosnot feels that “educators using a Behaviorist framework preplan a curriculum by breaking down a content area (usually seen as a finite body of predetermined knowledge) and assumed component parts – ‘skills’ – and then sequencing these parts into a hierarchy ranging from simple to more complex” (Fosnot. 1996, pgs. 8-9).

Behaviorism as a theory of learning, has been challenged on many fronts. Many psychologists feel that learning through this method results in passive students who are not trained to learn or think on their own; they have not been taught the art of reason or the use of their minds.

**Cognitivism**

As stated, Behavioristic science dominated American psychology until the 1960’s. Although Behaviorism was highly regarded as a theory of human learning, it proved to be too mechanized for many psychologists. Theorists began to stress the importance of the individual’s active participation in the learning process. These new theorists suggested that “we learn by forming a cognitive structure in memory that preserves and organizes information pertaining to the key elements in a situation. Thus, instead of simply responding to a stimulus, we make conscious choices that allow us to adapt to our environment” (Crooks, 1991, pg. 220). The essence of cognitive science is the belief that we learn through the processes of thinking, perception, insight and memory; or knowledge based learning, and once attained, what to do with it and
Jean Piaget (1896-1980) believed that these cognitive structures were inherent and developed through a course of stages. His first stage, the Developmental stage, lasts from birth to around the age of two. During this stage a child begins to construct knowledge through experience and the coordination of physical movements such as grasping, physical perceptions, etc. Piaget's second stage, the Preoperational, lasted from about the age of two to the age of seven. During this stage children still cannot conceptualize and still need the physical situation in front of them. During Piaget's third stage, the Concrete Operational stage, ages seven to eleven, children finally start to conceptualize things and to create logical structures which allow them to manipulate things in their minds without the use of the physical objects (Phillips, 1991, pgs. 41-43). Piaget's final stage of development is the Formal Operational stage, ages eleven to fifteen. During this time full adult thought has developed and the child can now formulate abstract thought (Charles, 1978, pg. 83).

More recent views on the cognitive theory have been described as a learning process through which we learn by a similar four-stage cycle. From early childhood individuals have two major competing dimensions of learning: the concrete/abstract and the active/reflective dimensions. The concrete/abstract dimension indicates how a human processes experience and information. The active/reflective dimension indicates how a human learns, either through active involvement or through reflective thought or reasoning. Typically, over time, individuals develop a preference for a specific dimension, concrete or abstract,
active or reflective. These preferences are a result of personal experiences, personality, environment, or prior educational factors. None of the preferences appear better than the other; however, it seems apparent that an educator should be aware of the possibility of learning differences from child to child (Sims, 1995, pgs. 5-7).

A similar concept of the cognitive theory explores the perception of individuals as either field independent of field dependent learners. Field independent learners are viewed as analytical problem solvers who prefer a more individualistic learning environment with less social interaction, an environment typical of the traditional classroom. Field dependent learners are viewed as individuals who prefer to study in small and large groups and, obviously, more social interaction (Morgan, 1997, pgs. 5-6). Again, the underlying theme, is the differences in learning styles, not necessarily which approach is better suited for classroom learning.

Cognitive science, in most respects, has replaced Behaviorism as the more accepted theory on learning. Cognitivism brought to light the notion that the mind is more of a reasoning instrument with knowledge based on attained knowledge, experiences and problem solving processes through which expected outcomes are perceived before they occur. Behaviorists chose not to regard the mind as a reasoning instrument but rather to regard the mind as a knowledge storage instrument in which knowledge was stored for use when an external stimulus was provided that resulted in an expected response.

Most recently, cognitive science has branched out to compare the human
brain to the functioning of a computer. Comparisons have been made to the memory and information processing areas of both the computer and human mind. The long-term memory, or information storage area, and the short-term memory, where problem solving typically occurs have many similarities in both. However, whereas computers may have larger storage capacities and faster response time, humans have more different experiences from which to draw knowledge to aid in the problem solving process. This comparison to the computer, and research based on computer models of the cognitive process, have limited the study of cognitivism because of the limited number of experiences that can be programmed into the computer.

**Situated Learning**

In the 1970's Cognitivism began to face less attention and commitment. In addition to limitations of computer modeling, another reason was increased attention to educational inequalities experienced by linguistic and cultural minorities. During the late 1970's, Situated Cognition and Learning surfaced as a response to the shortcomings of Cognitivism. Although the foundations of these two theories are based on mental processes of learning, Cognitivism explains learning more on an individual's interior functions without regard to external effects. "The principal theme to this new theory was the assertion that thinking and learning are fundamentally dependent for the proper functioning on the immediate situation of action" (Phye, 1997, pg. 31).

Therefore, as stated by this principle, thinking and learning are a result of
a given situation, both from a social and physical environment. Cognitivism stressed the importance of the ability of the mind to construct and manipulate symbols in various cognitive processes. Situated theory stresses the importance that humans and their interaction with society cannot be understood by using symbol system models but must be viewed within real world contexts to understand our reactions to any given situation.

Like Behaviorism, Cognitivism relied more on the internal processes of the mind and the individual learner. Situated Learning, however, stressed the importance of the world outside the mind and placed the learner within a group of learners (Reimann, 1996, pg. 32-33). “Learners have parents, siblings, teachers, peers, and their fellow learners; with all of whom they communicate and interact and from whom they receive guidance and stimulation” (Phillips, 1991, pg. 51).

This concept provides the basis for the Apprenticeship model of learning. Through this model the teacher, or expert, is present only to guide the student, or apprentice, through given situations until the student has achieved the knowledge required to complete certain processes. The teacher’s role is more that of a coach than an educator because the students are expected to learn on their own fostering self-guided exploration through the assistance of elders and peers. However the teacher is responsible for providing a rich learning environment with many various learning opportunities (Farnham-Diggory, 1990, pgs. 56, 70).

Under the Situated Learning model, learning is about becoming a
contributing member of the community rather than one who performs isolated tasks (Phye, 1997, pg. 38). Therefore, by providing a learning environment similar to the cultural context from which the learner belongs, knowledge will be built along the basis in which the student will be performing as a member of society.

From the teaching side of Situated Learning, problems exist in creating a rich learning environment equal for all students. Learning, under this model, extends outside the classroom to the learner's social environment of family, friends and neighborhood that may include diverse cultural settings that would prove difficult to mimic in the controlled environment of the classroom. If teachers choose to teach through a Situated Learning model, the classroom environment should provide, at least in some form, comparisons to the cultural contexts from which the students have already established a knowledge base.

**Collaborative Learning**

A learning process closely related to the Situated approach is the Collaborative learning theory. Although this approach does not necessarily view society as the overall learning environment, its foundations are based on a similar cognitive theory that we learn more effectively from a group of our peers rather than on an individual level; a single cognitive system exists within the group. In this regard, learning to become a self-sufficient, active member of society is learned on a micro-level within the classroom setting.

L.S. Vygotsky, a human development theorist, recognized that a key factor
to this type of social learning was the young person's ability to learn by imitation.
Interacting with adults and peers in cooperative social settings gives the young
learner ample opportunity to observe, imitate, and subsequently develop higher
functions (Phillips, 1991, pg. 53). For example, as a problem is presented,
usually a spontaneous division occurs within the group, divided between those
with prior knowledge of the subject and those without. Typically, those with the
prior knowledge are apt to respond in a task-doer role while the others take on
roles of observers who can contribute by criticizing and giving topic-divergent
motions until the problem is resolved. Those students with lesser degrees of
knowledge learn through imitation and observation. From any given problem to
another the roles of each individual in a group may change (Reimann, 1996, pg.
190). Again, similar to Situated Learning, the teacher's role is to provide a
learning environment in which the students can function more on a social level in
large or small groups instead of the traditional level of the individual learner.

Recent criticism of this theory of learning has come full circle back to the
concept of the individual learner. Students who are taught under this model are
sometimes viewed as lacking the individualistic abilities required to react in
certain social settings; that is, they may lack the ability to think for themselves.
Another criticism of this method is based on the practice of dividing people into
groups. A typical division of students is by abilities. Although this practice has
been used under many teaching methods on all levels of education for many
years, grouping can have detrimental effects. "Research indicates that ability
grouping has little benefit for high-ability students and locks low-ability students
into programs and classes or groups where they are stereotyped as weaker students and, therefore, receive an inferior education" (Phye, 1997, pg. 77).

**Constructivism**

A recent trend of the cognitive process to learning is the Constructivism approach. Like the Situated Learning approach, and to some degree the Collaborative Learning approach, Constructivism places the learner at the center of the learning process and the teacher more near the perimeter. The student in this approach is viewed as controlling his or her own learning. The teacher’s role is to assist the students in constructing their own knowledge.

The process of Constructivism is based on cognitive ideals, those of obtaining knowledge through a mental process. When we say that we know something, we imply that we have experienced it or thought about it before and that we remember our experience. This process of remembering occurred through: the cognitive process of acquisition, or how we acquire new information; storage, or the function of memory; and retrieval, or how the information is pulled from memory and brought into active use (Phye, 1997, pg. 48). Constructivism, therefore, is a learning method in which the students are trained to use their given cognitive abilities to construct knowledge through this process. In this light, the students are taught more how to learn than what to learn.

Constructivist teachers see their students as active participants rather than passive recipients during the learning process. “Learning is acquired through a complex interaction between a student’s personal purposes, their prior
knowledge and dispositions, and requirements for specific subject-matter inquiry” (Henderson, 1996, pg. 8). Simply stated, classroom learning is directed by the student from personal experiences and through subject matter that interests them.

Some of the general principles of Constructivism can be best used to describe this learning theory. First, learning is developmental. It regards invention and self-organization on the part of the learner. Therefore, teachers need to allow learners to raise their own questions, generate their own hypotheses, and test them for validity. Secondly, errors need to be perceived as a result of a learner's conception and therefore not minimized or avoided. Thirdly, students must be allowed time for reflective abstraction. Through this practice they seek to organize and generalize across experiences in a representational form which may facilitate reflective thought processes. Fourthly, based on the classroom environment as a community, the learners are encouraged to defend, prove, justify and communicate their ideas that assist in solidifying their knowledge. And lastly, learning should proceed toward the development of structures. As learners struggle to make meaning, progressive structural shifts in perspectives are constructed. During this process, earlier conceptions may be reorganized or undone. This process continues throughout the development of the learner (Fosnot, 1996, pgs. 29-30).

Through these principles students are allowed to learn from their own perceptions and interactions. They learn to construct their own knowledge through experimentation and exploration of hypotheses formed through cognitive...
processes and adaptation to the classroom environment.

In sum, Constructivism can be viewed as a theory of learning that construes learning as an interpretive, recursive, building process by active learners interacting with the physical and social world. It is a theory that describes how structures and deeper conceptual understanding come about rather than one that simply characterizes the structures and stages of thought or that isolates behaviors learned through reinforcement (Fosnot, 1996, pg. 30). Learners first experience the process of active problem-solving activities with others and gradually learn to become independent problem solvers through their own individual processes (Hogan, 1997, pg. 8).

Summary

Students have many reasons for learning: to receive high grades; to receive credentials; to avert pressures from parents or teachers; or to learn something that interests them. Students also have many ways of learning (Mulcahy, 1991, pg. 39). It is apparent from this study of learning psychology that there are many theories on how humans learn and that no one theory is accepted by all.

All the theories reviewed provide insight into different methods of human learning that are still accepted today, although to varying degrees. As noted earlier, Behaviorism was the most understood and credible theory throughout much of the 20th century. Recently, psychologists have deemed a persons experiences and cognitive abilities as the basis to what we learn and how we
learn.

As America continues to become more diverse in culture, religion, and race, the more diverse our experiences will become forcing a need to continually adapt our strategies to assist the learning process.
CHAPTER 3

TEACHING METHODS

The American dream for education is identified in the basic tenets of faith we hold in education. Chief among those tenets is the beliefs of what education provides. First, education makes possible equality of opportunity. Second, education is the golden path to the good life. Third, education is essential for a democratic society. Fourth, education begets technology and allows us to use it to best advantage. Finally, education is the prime avenue through which people maximize their individual and collective selves (Charles, 1978, pg. 41).

Although some of these points can be argued, they do help to understand why we educate. Many processes of education have evolved, all based on psychological learning theories discussed earlier. However, some argument exists in the best way to teach. “We know that effective teaching mirrors effective learning, yet as educators we have not mounted a serious effort to organize teaching around the learning process and then built educational systems that support what we know about the learning process (Marzano, 1992, pg.1).

This chapter focuses on different teaching methods and how they relate to present learning theories. The methods I elected to review were chosen...
because they represent sometimes vastly different approaches to reach similar goals. These methods are the Traditional, Group, Open Education and Montessori approaches.

**Traditional Teaching**

The traditional teaching method can be traced back to the theories of the behaviorist approach to learning. This method of instruction is based on passive learning through external stimulus. When the stimulus results in an expected outcome, usually determined through exams, reports, etc., it is assumed that the student has learned when acceptable levels of outcomes have resulted from this association.

This approach to learning, or associationism, was fostered by the efforts of Edward Thorndike. Thorndike, influenced by the behaviorist ideals, created a model for educators to follow in their teaching practices. This model was underwritten by the theme that vocabulary words or arithmetic facts could be quantified. Through the Thorndike model the amount a student learned through exercise, or repetition, could be measured through testing. This method of instruction has been used to teach students on every level of education since the 1800's and has proven difficult to replace even though more modern and acceptable methods of learning have resulted in teaching methods more adapted to present day beliefs.

The foundations of this method assumed that there is a fixed knowledge base and a teacher's responsibility is to give that knowledge to those who are
learning. This calls for the development of well-organized, clearly composed information that comprises the knowledge base. For example, in the area of literacy, "Literacy is conceptualized as a stable collection of hierarchical skills to be mastered. The student's goal is to decode text and get meaning. The teacher's role is to provide students with rules and skills to obtain that goal" (Hogan, 1997, pg.7).

Many teaching practices have been developed through the traditional approach. Chief among these practices are the diagnostic-prescriptive, competency-based, read-review-recite and expository teaching. Diagnostic-prescriptive teaching is a highly structured method that consists of the diagnosis of a students' strengths and weaknesses. Once any weaknesses are determined, a prescription is made to correct, or strengthen, the deficiency. Finally, a post-assessment is made by the teacher, usually through examination, to determine the level of accomplishment by the student.

Competency-based teaching is also a highly structured method directed by the teacher, although the students have some control to select among optional learning activities. Under this method, students are allowed to work at their own speed until they feel a level of competency has been achieved. Their levels of achievement are again measured through testing.

The read-review-recite method to teaching is also a highly structured practice completely controlled by the teacher. In this method, for example, the teacher presents a reading assignment. Once completed, the students are requested to review the material through written answers, class discussions,
essays, or other means to make it understandable. Once the review is complete, the students are asked to recite what was learned or are given a written exam in order to get responses from all the students in a lesser amount of time.

The last of these methods based on traditional educational practices is expository teaching. Again, the teacher is the central figure in the teaching process. Information is passed on through lectures and demonstrations completed by the instructor in efforts to help the students grasp information and concepts to a level they can understand. The role of the student is to pay attention and retain as much information as possible. Examinations are typically used to quantify the level at which the students learned (Charles, 1978, pgs. 204-211).

Although the traditional method of teaching has survived the test of time, it has been criticized by many of today's psychologists for its behavioristic approach and ideals that all students are assumed to have the same knowledge base, experiences and abilities to learn. Typically, a preset curriculum is issued that does not take into account diverse cultural experiences and student learning styles.

**Group Teaching**

Like group or Collaborative learning, group teaching is based on the theory that learning occurs best though the interaction with others. Humans mature intellectually in reciprocal relationships with other humans. Vygotsky pointed out that the higher functions actually originate in interaction with others.
Communication with others, particularly peers, is the most important aspect of this teaching method. Students learn to internalize information, to communicate their thoughts and create or negotiate knowledge with one another. Communication is the primary means for solving higher-order problems and developing thinking strategies in those with less expertise (Hogan, 1997, pg. 10).

The group teaching method focuses on the interactions among group members, on processes related to the pursuit of a common goal, on the give-and-take of information and opinion, on conflict resolution, on leadership and followership, and on facilitative procedures within the group. This group process was developed to further enhance society and to improve interpersonal relations. In other words, this method is directly aimed at the improvement of the democratic process. The teacher's role is to function as a participant in the group process, clarifying and counseling, but not to provide additional structure. The student's play the active role from beginning to end. They may look to the teacher for guidance but not for the final answers (Charles, 1978, pgs. 218-219). Through this process, consensus is reached through conversation on a number of levels, first in small discussion groups, next among the groups in the class, then between the class and the teacher and finally among the class, the teacher, and the wider community of knowledge (Shannon, 1992, pg. 208).

One goal of group teaching is to prepare students to become a part of society when their formal education is complete. Therefore, group teaching provides the opportunity for collaboration. Students who work together to frame
and to solve problems learn to take responsibility for their own learning and respect their own and others' thinking (Hogan, 1997, pg. 39).

This method of education has strong implications for the continuity of a democratic society. Many psychologists support the group learning philosophy and therefore, a subsequent group teaching method. However, many critics of this form of education exist. First, there are arguments that this type of teaching stifles individualistic thought and creativity, suppresses differences, and influences conformity (Shannon, 1992, pg. 209), all underlying principles of a democratic system.

Secondly, no method of teaching is more difficult to implement than group process. It is considered by some to be inefficient for learning subject matter, and most teachers, parents, and administrators still look on subject matter knowledge as the hallmark of educational effectiveness (Charles, 1978, pg. 218).

However, the greater benefit may be realized by the efforts of a group. No individual is expected to know the same things to the same degree, as occurs in the traditional classroom. Intelligence, in this model, instead of being held to reside in the individual, is held to reside in the group. Working together, the group can produce a brilliant collective product that no individual could have been expected to produce alone (Farnham-Diggory, 1990, pg. 63).

**Open Education**

Open education adopts some of the principles found in the Collaborative, or group, teaching method; the most important of which is the independence of
the students to direct their own learning. The difference between the two methods is that the students usually work or learn on an individual level.

Under this method of instruction the teacher does not suggest or direct but simply provides materials and activities for the students. Students choose to engage in them or not. They must, however, follow two basic ground rules: they are not allowed to do physical damage to the classroom, materials, or fellow students, and they must practice the golden rule in their dealings with others (Charles, 1978, pg. 222).

This type of education is considered by many as an alternative type of instruction. Some of these alternative type schools were influenced by A.S. Neill, founder of the Summerhill Private School (1960) in England, who stated that letting children do what they want will eventually result in effective learning. This view, however, has been hard-fought for acceptance in the United States and most alternative schools in this country do not completely follow this loose approach (Sanoff, 1995, pg. 98).

Within the Open Education classroom students are encouraged to learn through interaction with physical objects or cognitive processes, such as looking at the world through other eyes and trying to understand the experiences of other people and creatures. Students can learn of the physical environment outside the classroom by building suburbs out of cardboard and studying the lives of the people there (Kohl, 1969, pgs.67-68).

The concept of open education is that anything can be learned about in the open format. There is no set curriculum from which to teach or examinations
to quantify the level of student learning. Often times the teacher learns along with the students. Several methods of teaching can be used in the open education format: Projects, Inquiry/Discovery and Facilitation. All of these methods are similar in the respect that students are placed at the center of the learning process and are allowed to choose the topics of study. The teacher's role is to guide, clarify, communicate and provide learning materials.

The Projects method of teaching involves the students working together or individually, as they prefer. They are allowed to plan and organize their work. They are also allowed to do the legwork and rummaging around. Through interaction with the teacher or other students, if required, an end project results. The project, however, may focus on the process instead of a product. Through this method of teaching students acquire knowledge as they work through the project. Through a successful process they must understand what they are doing and have the insight of how this new knowledge interrelates to other projects. Finally, they must use what they learned to produce a final project. They will usually learn to use this information in new or more useful ways. Throughout the process they continue to evaluate their efforts and results (Charles, 1978, pg. 214).

A similar method to the Projects technique of teaching often used in the open educational classroom is the Inquiry/Discovery method. The purpose of this method is to develop the ability of the students to learn on their own; to obtain information; to organize it; to evaluate it; and to arrive at their own concepts, conclusions and generalizations. Through this process, the students
learn to use information, to become their own authorities, and to begin to think for themselves. The teachers role is to help the students focus in on a topic and to provide materials sufficient enough for the students to observe and consider (Charles, 1978, pgs. 219-220).

Many educators who have not used the open education format feel that chaos and loss of teacher control would result from this method of free student learning. However, many studies have shown the opposite as will be discussed in the following chapter.

Montessori

The Montessori approach to teaching was developed by Maria Montessori (1870-1952), an Italian physician turned educator. Many facets of the Montessori method are congruent with concepts of the Constructivist learning theory. Students learn to construct knowledge through interactive processes with the environment and physical objects. Further defined, "Montessori is an individualized educational approach which aids the child to learn by doing at his or her own pace within a sequentially prepared, socially enriching environment that encourages creative process learning" (Loeffler, 1992, pg. 66).

Montessori believed that a child develops through four stages: birth to age 6, the period of transformation of both character and intelligence; from ages 6 to 12, the acquisition of culture; from ages 12 to 18, the acquisition of independence through physical and psychic transformations; and ages 18 to 24, maturity through practical work and experience. The most important aspect of this
sequence of development is movement. Through movement we come in contact with external reality and the starting point of movement is not motor, but mental. Movement, to Montessori, has great importance in mental development (Loeffler, 1992, pgs. 21-22). Therefore, the Montessori classroom needs to provide a child the freedom to move about and learn by handling.

Aside from natural development, Montessori felt that learning occurred within a five-step process: observation of demonstrations, participation, role-playing practice, the Eureka moment, and performance. Through observation a child learns by watching someone perform a task he or she is interested in mastering. Through participation the child interacts with the person performing the task and the process creates a collaborative effort. Through role-playing the child will attempt to perform the task alone. The Eureka moment is when the child finally accomplishes the task and can repeatedly accomplish, or perform, the skill (Loeffler, 1992, pgs, 29-30).

The Montessori system is based on three basic components: child, environment and adult, or in the classroom context the teacher. The environment is further broken down into six parts: freedom, structure and order, reality and nature, beauty and atmosphere, the Montessori materials, and the development of community life. According to the Montessori approach, the child must be given the freedom of an open environment in which to coordinate his or her actions toward a given end and to achieve something the student has chosen to do. Structure and order is necessary to reflect the structure and order of the universe. This helps the student to internalize it and thus build his or her own
mental order and intelligence. Reality and nature are necessary to give the student the opportunity to internalize the limits of nature and reality. Montessori emphasizes the importance of contact with nature. Beauty and atmosphere are based on the idea that the classroom need not be elaborate, but be simple with high quality design. The Montessori materials are roughly divided into four categories: the daily-living exercises involving the physical care of person and environment; the sensorial; the academic; and the cultural and artistic. The last component, community life, must be allowed to occur spontaneously. The student learns the sense of ownership and responsibility to oneself and to others (Lillard, 1972, pgs. 23,180).

Like the Open education method, Montessori children are allowed to choose their own topics, or objects, of study and to work at their own pace. The students typically work alone but are encouraged to work together when caring for the environment, preparing food, role playing, playing games or working on academic projects if their levels of development are similar (Loeffler, 1992, pg. 105).

The teacher's role in the Montessori approach is to maintain the environment, to observe the students and help them act and think for themselves and to entertain them through storytelling, game playing, etc., in an effort to spark interest in the students. The teacher must also maintain the environment to provide the students with safe and aesthetically pleasing surroundings which allow for independence, freedom of movement, opportunities for social
development and an environment that reflects the child's culture (Loeffler, 1992, pgs. 37-38).

Critics of this approach point to lesser amounts of social interaction the students are exposed to along with lesser amounts of spontaneity, teacher participation and variance in teaching materials. However, this teaching practice does provide for more individualized, self-paced learning within a carefully prepared environment designed to provide higher levels of self-esteem, self-confidence and respect for oneself and others than may be found in classrooms of some other teaching methods.

**Summary**

Just as there are different opinions on learning theories, there are differing opinions about teaching methods. It is abundantly clear that individuals are different; therefore, no single method of teaching will work with all students. Those teachers who excel in their profession vary their teaching delivery methods based upon an analysis of the individual differences that exist among their students (Herman, 1995, pg. 2).

Education in America occurs in many ways. Based on the review of related literature, there does not appear to be a teaching method accepted by all and deemed to be the best suited for today's youth. Many educators and psychologists believe that a child's ability to learn under a given approach is dependent on their knowledge base established by experiences gained before
their formal education begins. Therefore, teaching approaches need to provide for the variety of learning methods that may be present in a given classroom.

As stated earlier, there is a need for the educational facility to mirror the educational approach to be most effective. However, this would prove difficult to provide if many different teaching methods are to be used to teach students who learn in a variety of ways. Nevertheless, there do exist similarities between many teaching philosophies that allow an educational system the opportunity to provide spaces suitable for different teaching methods to be used within a common school facility and still meet functional requirements.

Recent educational trends are providing for self-paced, self-guided education both on individual and group levels. These trends are partly based on the assertions that since people continue to learn throughout their lifetime, they should be taught more how to learn than what to learn. Since young people vary in physical development, intellectual capability, and interests, the need for diversity would be an important characteristic of a responsive school. In such a setting, students and teachers would be engaged in different learning activities, in and out of the classroom, using a variety of print and non-print materials, where a variety of teaching methods would be used (Sanoff, 1995, pg. 43). In this light, classrooms should be designed to provide an environment that is as diverse as possible in which an abundance of learning opportunities exist and one that allows for individual, small group and large group spaces.
CHAPTER 4

SCHOOL DESIGN

The school is the stage for some of a child's education. However, as stated previously, it can become the central focus. Architects can produce an environment that may either encourage or hinder the learning process. As noted by Ittelson, the spaces within the school affect a child's sensations and responses (Ittelson, 1974, pg. 180-182).

McQuade stated "with younger children, around five years of age, one of the things space can do is actually teach them. At five years old, children are engrossed by space; they are still finding out about the three dimensions" (McQuade, 1958, pg. 20). Learning involves a stable change in behavior as a person interacts with the environment. The student in school is constantly interacting with social and physical stimuli in the environment. Thus, the physical facility plays a key role in encouraging the quantity and quality of interaction a student experiences within the school environment (Kowalski, 1983, pg. 79).

This chapter provides a review of literature related to school design in an attempt to understand associations between design, space allocations, and the learning process.
Moos used the model below, Figure 1, to describe how five characteristics can affect the classroom climate. The figure notes how students and the settings mutually affect each other with respect to stability and change. According to Moos "the overall context (which includes school type, educational program and class subject matter) can affect the social climate directly. The architectural features can affect the school and classroom context directly (classes with movable walls facilitate innovation) or indirectly through their affect on organizational characteristics (open plan classes facilitate team teaching which may lead to higher teacher support), teacher characteristics (interpersonally oriented teachers are more likely to select open plan classes and to establish supportive climates), and student characteristics (amounts of personal space)" (Moos, 1979, pg. 160).

This model can be used to substantiate the beliefs that the physical characteristics of a classroom can affect what takes place in the classroom either directly or indirectly. As one of the five characteristics changes, an effect is caused on one or more of the others.
Public Schools

Moos also focused on comparing the types of public schools: urban, suburban, rural, vocational, and alternative type schools. The first four types of schools predominantly used traditional educational practices. The alternative schools were based on non-traditional educational methods such as Open Education or Montessori approaches. The urban area schools were found where the city population was listed to be at least 100,000. Suburban schools were found near cities of 100,000 or more. Rural schools were located in small towns far from urban centers. The author studied four hundred and nine classrooms, grouped by school type, to understand the differences more precisely (Moos, 1979, pgs.162-163).
Alternative school classes were found to score highest in student involvement, affiliation, and teacher support. This, Moos concluded, indicated that the alternative school provided for higher degrees of interpersonal relationship and that they concentrated on the socialization of interpersonal values. Moos also noted that, contrary to belief, the alternative schools were well organized (ranking highest in order and organization). These schools also ranked first in innovation of teaching practices which Moos felt increased the participation of students in shaping their own educational experiences. The alternative schools did, however, rank lowest in teacher control (Moos, 1979, pg. 163).

Vocational schools, those most similar to the traditional classroom, ranked the lowest in teacher support and innovation and the highest in competition among the students, clarity of rules and teacher control. These schools were described as businesslike or hierarchical. Another finding of the research, out of the expected norm, was that the vocational schools ranked slightly below average on task orientation, or not sticking to class work. Students in both alternative and vocational schools were equally committed to school, which was attributed to the fact that open schools do not change the rewards of classroom performance (Moos, 1979, pgs. 163-164).

The study concluded that the rural, suburban, and urban school classes were consistent with popular images. They emphasized supportive teacher-student relationships, though not as much as alternative schools, and stressed order and organization. Urban schools provided the highest scores on task
orientation and fell just below the alternative schools on class involvement. Rural schools scored at the mean on all of the divisions of the classroom environment scale used (Moos, 1979, pgs. 164-165). Appendix 1 contains a copy of the Classroom Environment Scale (CES) used by Moos for the studies.

The size, or student population, of the school has generally increased across the nation. The reasons for this increase have been partially based on economical reasons due to construction and land acquisition cost increases. By increasing the size of the school, certain ancillary functions can be duplicated; i.e., libraries, gymnasiums, and cafeterias. However, recent studies suggest that the increased numbers of students within a given school can cause negative reactions within the student body.

A study by William Fowler (1992) indicated that the effects of school size at the elementary school level seemed conclusive based upon the general findings of his study: (1) there is a negative relationship between math and verbal test scores and elementary school size, (2) larger elementary schools are detrimental to student achievement, (3) smaller elementary schools are particularly beneficial to African American students' achievement, and (4) the negative relationship between school size and school performance is most prevalent in urban schools. Studies by James Barbarino indicated that small schools (of approximately 500 students) have lower incidence of crime and less serious student misconduct. Larger schools (1,000 or more students), studies showed, discouraged a sense of responsibility and meaningful participation. Due to the results of studies like these, the Public Education Association (1989) and
others recommend downsizing elementary and middle schools to 500 or 600 students per school, arguing that smaller schools lead to a more humane educational system (Meek, 1992, pgs. 13-14).

Because of the land acquisition and construction costs it will almost always be more expensive to build two 600 student schools in lieu of one 1,200 student school. However, one design response to this is to create "schools within schools," or in other words, to create smaller environments within larger institutions. This can be achieved by breaking the school down into various "houses," each with its own identity (and sometimes with separate entrances) or other means whereby the size of the facility is diminished (Graves, 1993, pg. 158).

School Plan Types

Schools of the late 60's began to break away from the rigidly designed plans that provided a typical classroom size throughout and long corridors that connected the school spaces. The new schools often provided a large central space (auditorium, library, or multi-purpose room) with open classrooms around the perimeter of the space; see Figure 2, below (Graves, 1993, pg. 42). These new schools also began to use flexible space as a main design concept. Some of
these ideas provided an opportunity to create a variety of spaces in a limited environment. Many of these schools used operable partitions to close off larger rooms and provide for smaller, acoustically sound pods (Morisseau, 1972, pgs. 6-7).

The physical setting of an open classroom can contribute a great deal toward the creation of a positive attitude toward schooling by the children. The setting may provide the children a place that they feel belongs to them, which
they can change, and that will not be altered by others. It can permit a range of postures for working. Some children need to stretch out and attain physical comfort before getting into productive work. The setting can make the home-to-school transition less abrupt via the "de-institutionalization" of the physical environment (Evans, 1977, pgs. 1-3).

Recent data indicates that students from traditional schools described their ideal classroom as one that would provide them with "lots of comfortable places," and as a place where there were "lots of interesting things to do." Additionally, they would not like to spend the entire day at their desks. Open classroom students described their actual environment as one containing variety, with "lots of comfortable places." However, they also indicated that there were few places where they could be by themselves and it could be difficult to concentrate on what they were doing (Sanoff, 1995, pg. 44).

Architecture and physical design can influence psychological states and social behavior. A study by Myrick and Marx in (1968) noted that school design can be categorized as either cohesive or isolating. The study included a school with only two main classroom buildings (cohesive design) and one school that had several separate buildings (isolated or campus design). The results showed that the students and teachers at the school with the isolated plan spent more time traveling between rooms and had less time to interact informally before class. The cohesive layout facilitated the formation of larger student groups that promoted student conversations. Myrick and Marx concluded that a cohesive design encourages interaction through its compact layout and provided central
areas where students could gather. The isolated design discouraged interaction because of its extended layout, lengthy corridors and alternate routes for going from place to place (Moos, 1979, pgs. 6-8).

Today, architects are experimenting with the openness of the 1960's designs and the rigidity of the 1970's designs in new school plans. By modifying these ideas, new concepts have been developed that have changed the typical plan throughout the school. These typical plan types are the corridor, double corridor, cluster, courtyard, urban block, and the campus styles.

The corridor design (Figures 3, 4, 5, 6; pgs. 46-49) is one of the most straightforward arrangements of the classrooms used today with many variations possible. This fundamentally linear concept has many advantages: clarity of organization, ease of natural lighting due to the proximity of classrooms along exterior walls, and control of access to facilities (PA, pg. 11). This plan type also provides for stronger control of the student population as they enter or leave the facility. In areas where more stringent control of the environment is required, this plan would be efficient due to the minimal number of exterior access points. However, due to this arrangement students are forced to interact with a greater number of students; this may prove uncomfortable for some, making the school environment more stressful.

In moderate climates, main circulation routes could be directed outdoors which could allow for construction dollars to be spent on larger interior spaces. This concept, however, would reduce the control of the students due to the larger number of control points associated with an open plan.
The double corridor plan (Figures 7, 8, 9; pgs.50-52) provides economy and flexibility with an emphasis on interior space. This type of plan can be built quickly and can accommodate a variety of organizational plans. In this design, two parallel corridors give access to two zones. The major zone consists of classrooms, library, and administration. The gymnasium, cafeteria, assembly, kitchen, and lockers make up the minor zone. The double corridor type of design is well suited for harsh climates because it reduces the amount of exposed perimeter. The problem with this strategy is getting natural lighting into the interior of the school (PA, pg. 47). As with the corridor plan, control is strong in this design type, although there are typically more exterior access points. Exterior circulation would still provide for the construction of larger interior spaces except that interior corridors would still be required to reach interior functions.

The cluster type design (Figures 10, 11; pgs. 53 and 54) arranges groups, or clusters of classrooms, around a common area. This approach will often utilize open classroom design techniques. Typical in these designs are operable partitions that allow teachers to change the size and arrangement of teaching areas. Because of this, the cluster form of design is one of the more flexible forms of classroom design used today. The common spaces created along with the classroom clusters give the school a more intimate spatial quality and each student a greater sense of identity; each student affiliates with a group of classrooms, workrooms, and/or common areas. (PA, pg. 35). Additional concerns with this type of plan may exist if the school facility is too large. As discussed earlier, complex routes can create stress among many students.
Some students need to have a simple choice of pathways to make the school experience a positive, less stressful one. If the school facility becomes a complex array of buildings, typical with the lack of master planning and large student populations, the travel routes can become difficult to negotiate. If the school population is kept to a minimum, approximately 600 students as suggested by many school studies, the travel routes can become more manageable and the buildings more closely knit.

The courtyard design (Figures 12, 13; pgs. 55 and 56) is a traditional type of school building design. This design provides a central space, a controlled play area, and a variety of light for adjacent corridors and classrooms. The courtyard type is popular in southwest regions of the U.S. because students and faculty can circulate outdoors throughout the school year. Covered walks, uncovered courts and little or no internal circulation are typical in this style of design (PA, pg. 63-64). Due to the typical proximity of the classrooms around the courtyard, students are provided with many opportunities for “chance meetings” considered important by many educators. This plan, therefore, helps to provide a more social environment both inside and outside the classroom. With the interior orientation of the this plan, exterior study areas are protected from negative outside elements.

Due to the lack of space in inner cities, the design problem of schools is often solved by use of the urban block style (Figures 14, 15, 16; pgs. 57-59). This design lends itself to the high-density character of the inner city. In this style the urban schemes concentrate on the creation of exterior spaces. The courtyard is a
pedigreed urban form, and from the beginning of the modern school, a
reoccurring plan type. The courtyards of the urban block, unlike the courtyards of
rural schools, are left unplanted because they are more intensely used (PA, pg. 77). Currently, western cities don't lack the inner city space that makes this plan type attractive to school planners. Due to the urban sprawl of the west, most cities have, or can find, sufficient space to locate low-rise schools with adequate open space for student use. However, as land acquisition costs rise, this plan type may be considered in the near future. But based on my research, this plan type would not provide the best learning environment due to the tightness of space, little use of exterior spaces for social interaction, and the overall institutional feel of the facility.

The campus type plan (Figures 17, 18; pgs. 60 and 61) focuses on the creation of exterior spaces. In the campus style, the emphasis is on the relationship between the buildings rather than the buildings themselves. This emphasis closely resembles the ideals of the courtyard scheme but differs in scale; the campus type design deals with a much larger complex of buildings. In the campus scheme several buildings are designed around a series of courtyards (PA, pg. 93). One apparent drawback to this design type is the construction costs. Larger portions of land would need to be acquired and more exterior walls would need to be built. Both of reasons could make this type unappealing to school planners. However, this plan type should not be overlooked because there are many benefits to this design. These benefits include: individual classrooms or groups of classrooms that may help students develop feelings of

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
identity on smaller and, eventually, larger levels; clusters of buildings create many interesting spaces for causal interaction; and the number of exterior walls create various opportunities to provide for a free flow of interior study space to exterior study space that may enhance the learning environment.

The environment of the school must provide for a variety of learning opportunities. According to the American Association for the Education of Young Children, the best learning environment (both indoor and outdoor) is one that stimulates the child to want to learn, to reach out for new understandings and new experiences, to inquire about his or her environment and to provide security (AAEYC, pgs. 12-13). This is true of all the teaching approaches discussed earlier, but most notably under the Montessori approach.
Figure 3: Corridor Plan
Wareham High School
Wareham, MA
Figure 4: Corridor Plan
Pleasant Lake Elementary School
Walled Lake, MI

1 LOBBY  7 GYMNASIUM
2 ADMINISTRATION  8 KITCHEN
3 MEDIA CENTER  9 MUSIC
4 COMPUTER  10 ART
5 STAGE  11 KINDERGARTEN
6 MULTIPURPOSE  12 CLASSROOMS
Figure 5: Corridor Plan
Meriwether Lewis Elementary School
Albemarle County, VA
Figure 6: Corridor Plan
Blue Haze Elementary School
White Settlement, TX
Figure 7:  Double Corridor Plan  
Sun Valley Elementary School  
Birmingham, AL
Figure 8: Double Corridor Plan
Cherry Tree Elementary School
Carmel, IN
Figure 9: Double Corridor Plan
South Washington County Elementary School
S. Washington County, MN

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 10: Cluster Plan
Bluffsview and Slate Hill Elementary School
Worthington, OH
Figure 11: Cluster Plan
Rising Star Elementary School
Shawnee Mission, KA

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 12: Courtyard Plan
Trabuco Mesa Elementary School
Mission Viejo, CA
Figure 13: Courtyard Plan
Century High School
Santa Ana, CA
**Figure 14:** Urban Block Plan  
Prototype School  
New York, NY
Figure 15: Urban Block Plan
Stuyvesant High School
New York, NY
Figure 16: Urban Block Plan
Public School No. 5
New York, NY
Figure 17: Campus Plan
Centennial High School
Peoria, IL
Figure 18: Campus Plan
Pleasanton Middle School
Pleasanton, CA
CHAPTER 5

CLASSROOM ENVIRONMENT

“One of the most pressing questions concerning the programming and design of educational facilities centers around whether facilities play any significant role in the learning process. The conventional wisdom of superintendents and school boards is that the educational facilities simply provide the containers in which learning occurs, but that the form of the containers, and even the process of making them, has little to contribute to the real purpose of education, which centers around the curriculum and instruction delivered by the educator and received by the student. Recent thinking about learning, however, places more emphasis on the student as the center of the learning process and on heuristic curriculums that involve all sorts of objects and projects integral to the discovery process” (Meek, 1992, pg. 23). Therefore, the method of instruction is becoming more of a determinant into the kinds of spaces needed to teach today’s children, or to assist in the learning process.

The teaching method to be used in the school helps to define the curriculum. The development of educational specifications is the nucleus of good facility planning, and the development and analysis of curricula are the nuclei of educational specifications. The process of determining the scope of learning
activities involved in the teaching philosophies is an essential step in the systematic design of learning environments (Kowalski, 1983, pgs. 81-83).

The classroom space, to be comfortable to all, needs to provide areas that appeal to the different social-hierarchy orders and provides the diversity that is present in America today. As stated earlier, school is not just for book learning, but also for societal learning. The typical classroom should provide two types of space, public and private. These spaces will help the students understand societal ways (Altman, 1975, pg. 134). Public space can assist students in learning about group ownership, decision making and care taking, along with the hierarchies which exist in society. Private space allows students to possibly prepare a space that is theirs. Through use of these spaces, students learn respect for their own property, as well as that of others.

Not only does the environment need to promote learning, it must also inhibit environmental stress. "Environmental characteristics may be stressful when they hinder or deter students and teachers from achieving their goals in the classroom. For example, windowless classrooms may produce claustrophobic reaction, resulting in decreased attendance or attention to task in the classroom" (Ahrentzen, 1982, pg. 224). Several other factors can cause stress in school children. These factors include seating position and arrangements, lack of secluded study areas, school size and climatic conditions. Stress can also be either direct or indirect. Subject matter can provide direct stress. Environmental conditions, such as poor lighting, can produce a classroom with a poor learning atmosphere, or indirect stress.
The design of the school complex should be planned to reduce complex routes; buildings easy to read are easy to use. First time users, especially, want simple ways to navigate through a building or complex of buildings. When we are in personal control of our environment, we’re less likely to be disturbed by otherwise stressful elements. We are also more likely to be content and productive in our endeavors (Meek, 1992, pg. 37).

Air quality has also proven to effect student performances. Higher temperatures and humidity levels are associated with greater discomfort and decreased achievement (Evans, 1982, pgs. 231-233). Like all settings, the elementary school classroom is composed of both physical and social elements. Because these two domains are part of a system, each can influence educational outcomes directly (Moos, 1979, pgs. 6-8).

In meeting with the demands of today, schools need to be flexible. Of the five layouts described, all must be flexible, or adaptable, to be effective facilities. "Curricula will change. Technology will change. Class sizes will change. Educational approaches will change. And school buildings should be able to accommodate the changes comfortably. A good school is never finished. It evolves and adapts as people and programs evolve (Graves, 1993, pg. 7). There are four types of flexibility: malleable, which can be changed at once and at will; versatile, which serves many functions; expansible, which allows for ordered growth; and convertible, which can be economically adapted to program changes (Encyclopedia of Architecture, 1988, pg. 336); each of these layouts
provide benefits for well planned school facilities either economically or functionally.

The classrooms themselves must be flexible to allow for the turnover of students. Each student is different and the teacher may need to adapt his or her space according to the personalities of the students (NAFEYC, 1973). In moderate climates outdoor spaces can provide the teacher with additional learning experiences for the students (Praeger, 1966, pgs. 32-36).

**Classroom Size**

Economy is a common impetus behind the allotment of area for classrooms. Obviously, as the allotted area per student increases the construction cost of the classroom increases. School districts are constantly exploring the optimal classroom size based on current teaching trends, student aptitude scores, and construction costs. However, although classroom sizes are usually classified as "too small" by teachers and students alike, the functions within the space aren't necessarily altered by the space provided.

A study that focused on classroom size provided insight into the use of teaching spaces of different sizes. "All of the teachers in the large classrooms expressed satisfaction at the room size, but they were quick to emphasize that the larger classroom had not changed their teaching methods" (Sommer, 1969, pg. 103).

As described in earlier chapters, psychologists and educators both feel that group activities provide students with the opportunities to explore social
orders which is deemed important if the student is to be an active member of society. Classroom size can effect this concept. Since students need to participate in activities and smaller classes tend to be more cohesive, the smaller the group, the better chance the student has to participate in group activities which can help to promote a sense of belonging (Moos, 1979, pg. 161). An earlier study in 1964 found that students in smaller schools were more likely to participate in extra-curricular activities, had more positive self-images, showed greater personal responsibility, and were more sensitive to others' needs. By limiting class size and providing small group areas, students are given opportunities to participate in group activities on a micro-societal level.

One study in 1970 focused on classroom size of elementary schools. The research included a survey of 32 elementary schools built between 1950-1968 in Montreal and covered all income levels. Questionnaires about the physical aspects of the schools were distributed to 800 students and 400 teachers. Of the classrooms studied, it was found that the average classroom size was 725 square feet with an average of 28 students per room. These numbers equated to 26 square feet per student.

The results of the studies indicated a general feeling on all levels that the area of the classroom was inadequate. Teachers rated their classroom areas adequate 51% of the time. They were even less satisfied with storage space, with only 42% considering it adequate. However, sixty-three percent of the teachers felt the number of students was acceptable. The research findings from the teacher questionnaires, as shown on Table 1, showed a "strong relationship
between these 3 factors. For example, as satisfaction increased with any one of the factors, satisfaction increased with the other two factors, as well" (Artinian, 1970, pgs.2-6).

Table 1  Spatial Environment (Teachers)

<table>
<thead>
<tr>
<th>Percentage of Teachers Rating &quot;Adequate&quot;</th>
<th>No. of Students Per Classroom</th>
<th>Storage Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Schools with max. (84.5%) &quot;adequate&quot; responses to area (% satisfied)</td>
<td>78%</td>
<td>61.5%</td>
</tr>
<tr>
<td>8 Schools with min. (19%) &quot;adequate&quot; responses to area (% satisfied)</td>
<td>43.75%</td>
<td>25.5%</td>
</tr>
</tbody>
</table>

As indicated on Table 2, below, students seemed to be more sensitive to the confinement of their physical environment than were the teachers. The greatest satisfaction occurred in classrooms with a smaller enrollment (26 students) and a larger area (27.75 sq. ft. per student).

Table 2  Spatial Environment (Students)

<table>
<thead>
<tr>
<th>No. of Students - In Classroom</th>
<th>16-26</th>
<th>27-30</th>
<th>31-35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave. Area (Sq. Ft.)</td>
<td>715</td>
<td>715</td>
<td>750</td>
</tr>
<tr>
<td>Ave. Area per Student (Sq. Ft.)</td>
<td>30</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>% of Students Satisfied with area</td>
<td>54%</td>
<td>45%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Artinian's research also provided information on the attitude of the students and teachers. The students were asked two questions:

- Do you like being in your classroom?
If asked to remain longer in school, would you be glad, would you mind, or would you be sad?

The results indicated that the first question roused a more positive response than the second, as shown on Table 3, below. However, a strong relationship was found between the two questions; positive attitudes in one were accompanied with positive attitudes in the other. Effects were observed between spatial factors and attitudes. The classroom area and the students' attitudes were in inverse proportions. The table indicates that more positive attitudes were found in smaller classrooms where the students were provided a larger per capita space (Artinian, 1970, pgs.2-6).

**Table 3** Attitudes of Spatial Environment (Students)

<table>
<thead>
<tr>
<th>Being in the classroom (% Remain and Glad)</th>
<th>Ave. Area (sq. ft.)</th>
<th>Ave. No. of Students</th>
<th>Ave. Area Per Student</th>
<th>% Satisfied With Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Clssrms w/ max. <em>&quot;like&quot;</em> responses</td>
<td>22.5</td>
<td>700</td>
<td>25</td>
<td>28.5</td>
</tr>
<tr>
<td>9 Clssrms w/ min. <em>&quot;like&quot;</em> responses</td>
<td>8</td>
<td>760</td>
<td>30</td>
<td>25.5</td>
</tr>
</tbody>
</table>

The teachers were also consulted about the adequacy of their classrooms with concern to their teaching method and the physical and mental health of their students. The teachers' responses, as shown on Table 4, indicated that they were most critical of the first (adequacy of the classroom for their teaching method) and least critical of the last (mental health of their students based on the
adequacy of their classroom). When opinions of the teachers were favorable for one of the (3), their opinion of the other varied in the same way.

Table 4  Attitudes of Spatial Environment (Teachers)

<table>
<thead>
<tr>
<th>Teaching Method</th>
<th>Physical Health</th>
<th>Mental Health</th>
<th>Area</th>
<th>No. of Students</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Schools w/ max.</td>
<td>80.75</td>
<td>92.50</td>
<td>76.25</td>
<td>79.00</td>
<td>54.50</td>
</tr>
<tr>
<td>&quot;Adequate&quot; responses (87%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Schools w/ min.</td>
<td>50.25</td>
<td>67.75</td>
<td>29.50</td>
<td>48.50</td>
<td>30.50</td>
</tr>
<tr>
<td>&quot;Adequate&quot; responses (30.5%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Again, a direct and strong relationship was found between the above opinions and the response to the environmental factors. The more the teachers were satisfied with the classroom area, the more they considered the classroom adequate for their teaching method. From this study it was concluded that the size of the classroom, if adequate, would allow for any teaching method the instructor chose to employ (Artinian, 1970, pgs. 2-6).

More recent studies have indicated that the numbers of students within any given classroom be further reduced to provide a better environment for learning. William Fowler, of the Department of Education's Office of Educational Research and Improvement, summarized the literature on class size and concluded that students' attitudes, achievement, and voluntary participation increased in small classrooms (of 20 or fewer students). In small classrooms,
teachers have more interactions with each student; can provide a rich and vastly differing array of interactions; and can implement learning centers, student learning teams, peer tutorials, and other instructional strategies. More densely populated classrooms, as noted, have been associated with decreased attention, lower task performance, behavioral problems, and social withdrawal.

Project Star, a four-year study that followed 6,500 students in Tennessee from kindergarten through the 3rd grade found that children in even smaller classrooms (13 to 17 students per class) outperformed those in regular-sized classes (22 to 25 students per class). From this study it was concluded that within smaller classrooms (fewer than 20 students per class) student attitudes improved, achievement scores were higher, and greater teacher satisfaction and morale occurred because they could afford different and varied instructional practices.

A study by Glass and Associates (1982) further identified the benefits of smaller student numbers. From their meta-analysis, it was concluded that by reducing class size from 30 to 20 students, achievement scores increased by 6 percent. Further reduction (from 20 students to 10 students) yielded an additional 13 percent better scores on achievement tests (Meek, 1992, pgs. 17-19).

Another possible benefit to reducing class size could be realized because of the reduction of the possibilities of a wide range of preferred learning styles. Also, as the number of students in a given group is reduced, the number of vastly different life experiences will likely be reduced in the group, as well. Based on
this, the teacher will have a better opportunity to create a learning environment and adapt the teaching approach to be more conducive to the needs of each student.

Artinian's last study provided insight into other environmental factors such as temperature, lighting, and acoustics (see Tables 5, 6, and 7). Although these factors are beyond the scope of this paper, the research does have an impact on classroom satisfaction and it will be briefly discussed. The temperature of the environment, it should be noted, had little effect on the students' attitudes toward their satisfaction of the classroom. Table 5 suggested a greater satisfaction in the classrooms with higher light intensity. The range of light intensity was broad (104.5 - 118 foot candles); considered too bright by today's standards.

Artinian's summation of her research was that the students' satisfaction with the classroom was found to be in inverse proportion with the number of students in the classroom, and in direct proportion to the spatial environment. Students were more satisfied with the aural than the thermal environments, less with the luminous and least with the spatial environment. Students showed significant satisfaction with the classroom when their satisfaction with the acoustics increased and vice versa.

Teachers and students, alike, felt that the lack of space was the biggest inconvenience in the classroom. Students, however, proved to be more critical towards their physical environment than their teachers (Artinian, 1970, pg. 7).
Table 5  Luminous Env. vs. Spatial Env. (Students)

<table>
<thead>
<tr>
<th>Students</th>
<th>Area</th>
<th>% Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 CR'S w/ max. satisfaction w/ lights on desks (72%)</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>8 CR'S w/ min. satisfaction w/ lights on desks (27.25%)</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>9 CR'S w/ max. satisfaction w/ lights on boards (67.5%)</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>8 CR'S w/ min. satisfaction w/ lights on boards (24%)</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>9 CR'S w/ max. satisfaction w/ lights in the CR (77.5%)</td>
<td>56.5</td>
<td></td>
</tr>
<tr>
<td>8 CR'S w/ min. satisfaction w/ lights in the CR (42.75%)</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

Table 6  Aural and Luminous Env. vs. Spatial Env. (Students)

<table>
<thead>
<tr>
<th>Students: Do you hear what the teachers say</th>
<th>Area, % Satisfied</th>
<th>Lights in CR, % Satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 CR'S w/ max. &quot;very well&quot; responses (90%)</td>
<td>51</td>
<td>75.5</td>
</tr>
<tr>
<td>8 CR'S w/ min. &quot;very well&quot; responses (43.75%)</td>
<td>36.5</td>
<td>48.5</td>
</tr>
</tbody>
</table>

Table 7  Attitudes: Aural Environment (Students)

<table>
<thead>
<tr>
<th>Students: Being in the CR</th>
<th>Hear Teachers, % &quot;very well&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 CR'S w/ max. &quot;like&quot; responses (87%)</td>
<td>78.5</td>
</tr>
<tr>
<td>9 CR'S w/ min. &quot;like&quot; responses (40.75%)</td>
<td>57</td>
</tr>
</tbody>
</table>
A number of studies have been done to understand how the spatial density of the classroom is related to various student behaviors. Some of the studies have investigated aggressive behavior in dense classrooms (spaces with less than 30 sq. ft. per student). For example, Ahrentzen, in a 1981 study, found that teachers in classes with more open perimeter space reported less crowding, and teachers in classes with greater ceiling height reported less distraction from physical contacts with students. Architectural modifications used to distort perceptions of space, such as higher ceilings and more open perimeter, may consequently effect the perception of crowding, especially in lower budget, smaller classroom schools (Ahrentzen, 1982, pg. 236).

**Classroom Configuration**

The open space of a classroom has taken on many shapes as illustrated by Figure 19, below. These spaces can be utilized as one large room, as in traditionally designed square or rectilinear spaces. “The new emphasis on respecting the diversity of student learning styles, however, means that the overall instructional space should be divided up into a variety of smaller learning environments (Meek, 1995, pg. 7).
Figure 19: Open Space Forms

Large open space rooms are currently used because the configuration of the space can change almost instantly. Although the open space can be used as one large area, the space can be sub-divided into smaller spaces with the use of varying equipment. This equipment may include operable or demountable partitions, rolling cabinets, or bookshelves. As divided spaces they create classroom clusters, or pods, that open to a larger instructional space; see Figures 20, 21, 22, below.
Figure 20: Multi-Group Plan 1
Figure 21: Multi-Group Plan 2
Figure 22: Multi-Group Plan 3
At this time, there is no conclusive evidence that either open-space or traditional design enhances performance. Two large-scaled studies were completed to understand any differences that may exist between the designs. The first study was made by the metropolitan Toronto School Board (1972) which included 367 teachers and 1,078 students in 24 elementary schools of both traditional and open design. The second study was done in Sweden in 1976 and involved 4,500 elementary and junior high school students in 160 classrooms, also of both open and traditional design. Of the sixty testing instruments used, no simple relationship was apparent between open space and achievement; although students with good academic records performed better on achievement tests in open classrooms and students with poor academic records and psychological problems scored better on the tests in traditional schools (Ahrentzen, 1982, pg. 241). In early elementary grade levels, it would be difficult to separate the higher achieving students from lower achieving students by classroom until a clear image of their learning abilities is defined, so there appears to be no clear advantage for either open design or traditional design. Also, as discussed earlier, when children are separated by ability level, there does not appear to be large benefit for higher achieving groups and lower achieving groups tend to receive an inferior education.

**Seating Arrangement**

Proshansky noted that it is important to recognize that the effects of the classroom environment can be both direct and indirect. For example, students in
a classroom with seating arranged in straight rows are unable to carry on a classroom discussion because hearing is sometimes difficult. By the arrangement of the desks, the students are directly influenced. Teachers frequently prefer class participation, but this arrangement implies the opposite (Proshansky, 1979, pg.27). Schools with movable furniture encourage rearrangement to carry out a variety of activities, including arrangements better suited for discussions.

A study by Getzels in 1974 focused on the idea that varied arrangements of classrooms imply varied images of the student. The rectangular room with chairs bolted to the floor and organized in straight rows, as would be found in traditionally organized American schools, gave an image of an "empty organism," an organism that only learns from the teacher. The square classroom, with movable chairs and the teacher's desk in the corner, fits the image of the "active organism," one which participates in the learning process. The classroom without a teacher's desk, in which the student's desks are trapezoidal, to make a circle when placed next to one another, gave the image of the "social organism." From this shape the students learn primarily from their peers.

A rectangular-shaped room lends itself more readily to activities than a square one and is more easily supervised than an L-shaped room. However, Artinian's research suggested that square rooms were preferred because the sight lines have equal length, where rectangular rooms are less preferred because the sight lines increase. Wide rectangular rooms were the least
preferred because the sight lines were excessively shortened. See figure 23, below.

Figure 23: Classroom Sight Lines

Other studies conducted by Ahrentzen in the 70's focused on the participation of students in classrooms arranged in straight rows. One such study, testing 32 classes at the primary and secondary levels, found the greatest amount of verbal interaction among those students sitting in the desks in the front and central rows (the "action zone" as described by the author). It was found that the "target" of teacher-initiated conversation was overwhelmingly located in this "action zone" (Ahrentzen, 1982, pg. 221).
Another study of class participation also provided insight into classroom arrangement. Six rooms were chosen for the study:

- 2 were seminar rooms that offered horseshoe or open square arrangements,
- 2 were laboratories that offered extreme examples of straight-row seating,
- 1 was windowless, and
- 1 had a long wall composed entirely of windows.

The results of the "seminar arrangement" study showed more participation by the students directly opposite the instructor, see Table 8, below. The "straight-row arrangement" resulted in numbers which indicated that the students in the front row participated in discussions more than students in subsequent rows and students around the walls participated more than students in any row but the first. This gave credit to the author's eye-contact hypothesis, that only students in the front row and side rows have a clear and relatively unobstructed view of the teacher.
Table 8  Student Participation in Seminar/Lecture Rooms

<table>
<thead>
<tr>
<th>Student Seating Position</th>
<th>Side table (N=226)</th>
<th>Table directly opposite instructor (N=141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old seminar room 1st (6) weeks</td>
<td>1.63</td>
<td>2.42</td>
</tr>
<tr>
<td>Old seminar room 2nd (6) weeks</td>
<td>3.19</td>
<td>4.62</td>
</tr>
<tr>
<td>New seminar room 1st (6) weeks</td>
<td>2.89</td>
<td>3.69</td>
</tr>
<tr>
<td>New seminar room 2nd (6) weeks</td>
<td>0.88</td>
<td>1.97</td>
</tr>
<tr>
<td>Total: All rooms</td>
<td>2.08</td>
<td>3.15</td>
</tr>
</tbody>
</table>

N = Number of volunteer statements

The study involving the open and windowless classrooms will be reviewed in the next section on windows and study spaces in classrooms (Sommer, 1969, pgs. 112-119).

Similar studies by Joan Crawford and Jan Ebert resulted in similar statistics. These studies also showed that the classroom arrangement can effect participation by students. By providing classrooms where students can be equally seated with respect to each other and the teacher, participation by a larger portion of the classroom population is possible.

**Windows**

Other physical aspects of the classroom, such as windows and individual study spaces, have an effect on the learning environment. Although they have a more indirect impact on the environment, they also must be discussed as a part of the complete learning space.
Schools without windows in the classroom are becoming more common. Many urban schools are providing windowless schools for protection of students and property. Furthermore, the proponents of the windowless classroom mention freedom from excessive heat, glare, and distractions. On the opposite side, opponents speak to the lack of visual access to the outside and claustrophobic reactions to the solid walls that may reduce student comfort.

The second part of Sommer's research focused on classrooms with and without windows. The study indicated there was an unmeasurable difference in the amount of student participation, based on seating location, between the two classrooms, see Table 9, below. The students in the first row participated more than students from other rows, but there was not a reliable difference. The numbers were complicated by late comers who typically sat in the front row (41 out of 51 sat in the front row). When the late comers were taken from the statistics, the numbers indicated as the previous tests, the students in the front row participated in discussions significantly more than any other row. Therefore, it does not appear that student participation in classroom discussions is measurably effected by the lack of windows.
Table 9  Student participation, by row, in conventional classroom arrangement

<table>
<thead>
<tr>
<th>Student Seating Position</th>
<th>Row 1 (N=144)</th>
<th>Row 2 (N=162)</th>
<th>Row 3 (N=128)</th>
<th>Row 4 (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open (windowed) room 1st (6) weeks</td>
<td>2.30</td>
<td>1.88</td>
<td>1.45</td>
<td>0.80</td>
</tr>
<tr>
<td>Open (windowed) room 2nd (6 ) weeks</td>
<td>1.25</td>
<td>0.76</td>
<td>1.20</td>
<td>1.10</td>
</tr>
<tr>
<td>Windowless room 1st (6) weeks</td>
<td>1.00</td>
<td>0.78</td>
<td>0.97</td>
<td>------</td>
</tr>
<tr>
<td>Windowless room 2nd (6 ) weeks</td>
<td>2.38</td>
<td>1.57</td>
<td>1.78</td>
<td>------</td>
</tr>
<tr>
<td>Total: All rooms</td>
<td>1.77</td>
<td>1.23</td>
<td>1.32</td>
<td>0.95</td>
</tr>
</tbody>
</table>

N = Number of volunteer statements

Several studies by Collins (1975), Demos, Davis, Zuwaylif (1967), and Larson (1965), found no significant differences in achievement scores, grade point averages, health records or personality test results in elementary school students (Ahrentzen, 1982, pg. 231) in classrooms without windows. However, a study by Artinian noted that the children were less satisfied when they faced the wall opposite windows. Although many educators today feel that windows in classrooms provide more distractions than benefits, Arthinian’s research showed that windows, at least in elementary schools, are a valuable element if student satisfaction has an effect on their learning abilities. Further, studies completed for office buildings have indicated that employees are more efficient at their work (sometimes up to 25%) if the spaces are provided with windows. “Most architects today understand the importance of bringing natural light and views into school interiors and relating appropriate rooms to outdoor spaces. Even in
urban settings, architects are carving out small plazas and bringing more sunlight to the inside spaces" (Graves, 1993, pg.73).

**Study Spaces**

Many classrooms provide study areas for use by the students outside normal teaching/lecture periods. Study spaces are secluded spaces and are intended to accommodate only a few students. They are typically separated from the rest of the classroom either by changes in floor level or by walls or partitions. A study by Ahrentzen (1981) found that these spaces were particularly important to students. Sixty percent of the students surveyed said that when they really needed to concentrate, they would use these study areas. As discussed earlier, these areas are important not only for study reasons away from scheduled lecture periods, but dependant on the teaching method used, some students who prefer to work alone or in small groups may use these spaces continually throughout the school day. Privacy has been shown to assist a child’s growth and development and consequently opportunities for increased privacy, such as secluded study areas, have been recommended especially for reading. Further studies have indicated that although some students prefer seclusion, they do not prefer areas that are visually secluded or isolated from the rest of the classroom (Sanoff, 1995, pgs. 41-42). Under Montessori or Open Education formats where students are allowed to work on self-selected subject matter and at their own pace, these spaces could be considered the primary work place if any students learn better on an individual level.
CHAPTER 6

CONCLUSIONS AND DISCUSSION

The physical environment has a direct impact on human health or well being. It is the interaction of individuals with physical features of the environment that one must look at to more adequately understand how school environments effect behavior.

In the early 60's and 70's school districts filled the lack of school space with unused factories, supermarkets and shopping centers. In many cases, this "found" space was quite useful for schools. Teachers and students typically reported that they felt more freedom to adapt these spaces to fit their needs (Kowolski, 1983, pg. 29).

Traub, Weiss, and Fisher (1977) differentiated between openness in architecture and openness in school program in thirty elementary schools in Ontario. They found that teachers in schools with open program and open architecture had higher positive attitudes than those in other schools. Teachers in open-space schools interacted more often with other teachers, and students in these schools had higher positive attitudes toward school, teachers, and themselves (Ahrentzen, 1982, pg. 243).
This research parallels the findings of this study, at least in regard to the openness or flexibility of the teaching space. Flexible space not only allows for a change of teaching method and classroom arrangements within a given space, it also allows for the possible change of enrollments from year to year.

The result of this study found the hypothesis "the classroom design must reflect the teaching philosophy employed in the classroom to maximize the learning potential in students" to be unmeasurable due to the uncertainty of which teaching method is best for student learning. Since teaching philosophies continue to evolve and children have many ways of learning, it is clear that "the best learning" method is impossible to identify. All of the literature reviewed relating to the classroom environment discussed the importance of the physical space of the classroom and how learning can be enhanced by the environment. However, the importance of the physical space was determined more by the amount of space rather than the shape. If class participation is a determining factor in the level of learning, then seating arrangement was nearly as important as the space size. Teaching, as this researcher found, is ever changing with respect to how students are taught. To adapt to the changing philosophies, schools should provide a variety of spaces in which a variety of methods could be used to teach students with different levels of learning abilities and ways of learning.

The typical classroom of yesteryear, that of the student learning directly from a teacher in a rigid organized manner, has changed significantly since the turn of the century. Most educators believe that the student should be allowed to
have a voice in his/her own education. As discussed in the chapters on teaching and learning methods, recent trends are geared toward assisting the student in the construction of his or her own knowledge. Students are given more freedom to direct what they want to learn, how they want to learn and the pace at which they achieve their knowledge. Experimentation in teaching practices has become common place. This research found that the experimentation will continue. One opinion of future teaching methods indicates that teachers will be assigned according to the type of teaching they do best. Students who work well alone will be assigned to teachers who are best at teaching large groups. The students that need more guidance will be assigned to teachers that work better with smaller groups and can provide one-on-one teaching (Centron, 1985, pg. 31). This philosophy would create a need for a variety of classroom sizes and a variety of spaces throughout any given school.

As a response to the changing philosophies, this researcher determined that the physical space needs to provide for flexibility in its design to allow different teaching methods to be utilized. The teaching environment should be flexible in size, shape, seating arrangement and provide areas for individual, small group or large group study. The open classroom approach to teaching, although not completely accepted by educators, requires a space that can be changed almost at will. This approach, as researched, did give the students a choice for individualized learning but several problems of the method made the compatibility with the physical space uncertain. Typically, teachers in this country are taught under traditional methods of education. This research found
that when some teachers are given the opportunity to teach within an open space format many have discovered innovative ways to close off their space from other classroom groups to provide spaces more accustomed to the their past experiences. However, this approach did bring to light the need for changeable space, or flexibility, in which new teaching methods, as they arise, can be employed.

Schools today need to provide the diversity found in normal everyday life. As American society becomes more diverse, any given school can expect to have a wider variety of childhood experiences brought to the classroom that will effect student learning. Therefore, the school should provide variations in all aspects of the facility. In an environment often characterized by denial, delay, and discipline, it's not surprising that people who spend their days in schools often describe that experience favorably only when they are afforded personal choices. School users prefer areas offering the widest selection of activities, equipment, spaces, supplies, routes, and people possible. Therefore, schools should be planned so that users "bump into" different choices on a daily basis (Meek, 1992, pg. 35). Appendix 2 contains a checklist of considerations when planning a school facility.

Also discussed in the literature review were types of public schools in the United States: vocational, alternative, urban, suburban, and rural. The discussion on the alternative type paralleled the discussion of the open plan school. The alternative school scored high on research tests that included studies of student involvement and affiliation, teacher support, order, and
organization. This school type also ranked first in innovation of teaching practices, which may be a result of the open, flexible plans used for the classroom. Alternative schools, however, ranked lowest in teacher control as was also a concern for the open plan teaching method.

As the research found, students and educators favored a smaller classroom population (15 to 20 students). The open plan approach, which typically utilizes large spaces, can be divided into smaller spaces through the use of partitions or space dividing furniture that can assist the teacher in forming smaller, more manageable student groups.

The review of related literature on school plan types focused on the corridor, double corridor, cluster, courtyard, urban block and campus plans. When considering the American southwest, and the Nevada region in particular, two of the plan types appear to be best suited for this climate: the cluster and courtyard designs. Both plan types can offer a variety of interior and exterior spaces along with a variety of routes to choose from when going from place to place. If critical functions are placed near a central circulation path, many opportunities will exist for casual interaction among students and faculty; see Figure 24, below (Meek, 1995, pg. 16).
Figure 24: Space Relationship Diagram

There are several advantages of the cluster design. It is one of the most flexible in respect to classroom design. If the clusters share common perimeter walls and use moveable interior partitions, the teaching space can be readily changed to various shapes and sizes. The clustering of the buildings provide for a number of intimate exterior spaces where teaching, especially in the Las Vegas
climate, can be continued outdoors. With the explosive growth of the Las Vegas region, a consideration for expansion should be given when planning school facilities. Cluster type schools provide for a variety of expansion opportunities. However, simply in-filling open exterior spaces with new facilities should be carefully planned to avoid the loss of valuable exterior study or social areas. As mentioned earlier, this plan can result in lengthy and complex circulation routes that may cost students the opportunity for casual social timed considered important by many educators and psychologists.

The courtyard design emphasizes outside circulation patterns. However, unlike the cluster design, the routes can be more linear. Both of these designs can include individualized classrooms and larger centralized group spaces, such as dining areas, libraries, and auditoriums. The diagrams below, figures 25, 26, 27, 28, show how the two designs can be configured to provide the flexibility of design needed for expansion, individual and group spaces, and more efficient circulation patterns. The spaces within the main courtyard provide numerous opportunities for social interaction of the students without being too distant from their destination point.
The schematic site plan shown above, figure 25, provides for a variety of spaces both at the interior and exterior of the building. Students more adept at learning in smaller, more intimate groups, or even on an individual level, can be taught in the individual classroom spaces (see Figures 29-32 for further discussion on the classroom spaces). Students who prefer to learn within larger groups can be taught from within the larger classrooms. This plan also provides for short circulation routes from space to space within the protected confines of the semi-enclosed courtyard. The courtyard remained open to provide views...
outside the central courtyard. The exterior study areas provide the students with the opportunities to study in more isolated and private surroundings, although supervision may be warranted if negative outside influences are present. Dependent on the arrangement of the open space around the school, such as playgrounds and sports facilities, visual supervision may be easily attained from within the classrooms themselves if windows are provided. However, the arrangement of the buildings create many study areas within the courtyard that are less isolated.

Figure 26: Schematic Site Plan 2
Much of what was outlined for figure 25 is reflected in the schematic plan shown on figure 26, above. A variety of smaller exterior spaces are provided with four spaces shown at the interior on the main courtyard. As shown before, the library was placed at the center of the courtyard to provide easy access from all classroom pods within the protected space. With the inclusion of windows facing the library on all interior oriented walls, the corridor provides for supervision throughout the space.

Figure 27: Schematic Site Plan 3
The schematic site plan above, figure 27, provides similar concepts as the previous schematic site plans. However, the plan, along with figure 28, shows how expansion can be easily accomplished and maintain the design theme of the plan. As additional classrooms are added, the exterior study or social spaces are further divided to maintain area sizes that are more comfortable for smaller groups when the student body size increases.

**Figure 28:** Schematic Site Plan 4
As discussed, several of the learning methods reviewed indicated a need for students to learn through collaboration. The schematic site plans above provide students with varying degrees of opportunities to learn from or teach each other. The classrooms, as grouped, provide social opportunities on several levels. Within individual classrooms students are provided with a more intimate social atmosphere to collaborate with their immediate classmates (approx. 20 other students). Due to the close proximity of adjacent classrooms, students can further collaborate with students from several other classes or grades. Lastly, students can collaborate with students from throughout the school on a macro-level either by direct involvement within school functions or by chance meeting within the courtyard outside normal school functions.

Expansion is a key component of modern buildings. It is most necessary in educational facilities. As seen in the preceding diagrams, with the school designed as individual or interlocking blocks, the plan can be expanded easily by addition of more blocks. The use of exterior passageways will reduce the cost of expansion due to the fact that little or no modification to the existing facility will be required and budget dollars typically used to enclose space can be used to make larger classrooms in lieu of interior circulation routes.

The study indicated that the greatest satisfaction for classroom enrollment by students and teachers was 20 or less students. The per capita area per student was most comfortable at between 25 to 30 sq. ft. These figures indicated a classroom size of approximately 600 sq. ft. which is at the norm for most classrooms studied. These figures hold true for most elementary school
classrooms, grades 1-6. Kindergarten classrooms, however, require nearly twice
the square footage requirements. Studies and most standards suggest that the
requirement for Kindergarten classrooms provide between 40-50 sq. ft. per
student.

At present, space requirements are undergoing studies to standardize
square footage needs per student. Two reasons exist for this trend. First,
architects and administrators require a "rule of thumb" number when planning
school size and to justify dimensions. Secondly, a recent court decision has
required more equality in school facilities (Graves, 1993, pg. 72).

The idea of fluid space within the open plan of a flexible space school can
benefit from these "standardized requirements." Since enrollments fluctuate for
many reasons (economy, migration, birth rates, etc.), school administrators can
adjust classroom sizes as needed based on expected enrollments before the
session begins. As mentioned, most educators believe that the classroom needs
to be sized accordingly to the activities of a given teaching approach. Therefore,
to be successful the space requirements of a classroom may need to be altered if
the approach of the faculty changes. The size of the classroom, if open and
flexible, can be readily altered to fit the new approach.

The best classroom shape for teaching was not clearly defined in this
research. Some studies suggested that the rectangular shape provided a better
space for a wider range of activities, whereas other studies claimed this shape
proved to have longer sight lines which inhibited class participation. These
studies suggested square shaped rooms provided more consistent sight lines
throughout. The use of circular or odd shaped rooms could also provide for adequate sight lines, but the shapes would make expansion difficult and potentially cost prohibitive.

The figures below, 29-32, present one possible solution to space needs based on this research. Figure 29, shows a large space created by four square spaces placed together with circulation routes placed between the squares. The space can be sub-divided with equipment to create various sized and shaped learning and teaching areas.

Figure 29: Schematic Classroom Plan 1

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Based on needs, interior portions of the classroom space can be segregated to create smaller self-contained classrooms with their own entries to the surrounding courtyards or study spaces; see figures 30-32.

Figure 30: Schematic Classroom Plan 2
Figure 31: Schematic Classroom Plan 3
The last Schematic plan, Figure 32 above, shows how the space can be finally sub-divided into four distinct classrooms with direct access to the outside. Although these may be individual classrooms, they still share a common facility. As the research indicated, students typically require spaces that allow them a certain amount of ownership and responsibility to make the home-to-school transition less stressful. By creating these smaller classroom pods within a larger building, and finally within the whole school complex, the students are awarded...
the opportunities to learn within smaller environments first and then to expand to the larger environment as their comfort levels increase within the larger social context.

This research concluded that most teachers and students preferred study spaces for individuals or small groups. By providing study spaces, the actual teaching area for teaching the class as a whole may be reduced if square footage/student standards are used for determining classroom size. However, studies have shown that higher ceilings help to alleviate some of the claustrophobic feelings associated with spaces in which the square footage per person was less than normal. The higher ceilings altered the appearance and feeling of the space. Since this study concluded that study spaces should be smaller, more intimate areas, the higher ceilings could disrupt the feelings of intimacy in the space. The figures below (33 and 34) provide a possible solution to both concerns of higher ceilings and study spaces.

![Diagram of Classroom Elevation 1]

**Figure 33:** Schematic Classroom Elevation 1

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
The raised platform helps to provide a psychological separation from the remainder of the classroom but does not create an isolated space out of view from the main instructional area. However, the raised platform area does create a problem within a space designed for varying degrees of open space if the platform is fixed. Therefore, the platform could consist of modular, interlocking units, guardrails and steps which can provide for a variety of study space shapes which would also provide the students with the opportunity to personal the classroom though a variation of floor plan solutions.

This research reviewed the design of classroom and the activities inside the space. Seating arrangement was found to be an important element that helps to define space. The research found that "action zones" existed in typically arranged classrooms. Part of the reason for this was teacher caused, as they frequently taught from their desks and sight lines were best throughout the "action zone," within close proximity of the teacher and with direct sight lines. To make the space as useful as possible, the furniture within the space should also provide for a wide variety of arrangements and be sized according to the age of students.
the students and light enough for them to move. The modular shapes discussed for the classroom also work well for desk design because desks, themselves, are also typically modular units. The figures below (35 and 36) offer examples of how square, rectangular, and trapezoidal desks can be arranged in different patterns depending on the task and method of instruction.

Figure 35: Desk Configuration - Social, Collaborative Layout

Like the circular shapes mentioned for the classroom designs, circular desks are difficult to use as modular units because they don't allow for a variety
of use as do some other shapes and they tend to have a fixed number of seats that can be placed around the perimeter.

Figure 36: Desk Configuration - Class Discussion Layout

Flexibly designed spaces should provide the opportunity for a variety of desk arrangements and the furniture should be of the size and weight which will allow for the students to move the furniture themselves. The study concluded that the best seating arrangements for student interaction was diagonally at any given table and that the teachers should be provided with space to travel from group to group or student to student.

This study found no individual teaching method to be considered as the best. Most educators believe that the space within the classroom should reflect
the teaching method employed. Because no distinct teaching approach stands out and new approaches are frequently being implemented, the design of the classroom space should allow for a variety of methods. This is best achieved by use of flexible space; moveable partitions, furniture, etc. The school benefits from the use of changeable, flexible space, if enrollment levels fluctuate.

The plan type of school best suited for the Las Vegas region was found to be either the cluster design or the courtyard design, or a combination of the two. Both plan types provide opportunities to create a variety of interior and exterior spaces that allowed for circulation routes that make "chance" social interaction possible between faculty, students, and administrators. Careful planning can further enhance the possibilities of creating environments for individual and group sized spaces within the school facility.

Although no one teaching method is deemed best, several methods are proving to provide the best results in student achievement. The methods considered the foremost for teaching today's children are those methods that allow for self-directed education; although this may later prove to be more of a trend than a solution to lower achievement scores. However, current data appears to indicate that those students who are taught "how to learn" over "what to learn" seem to achieve happier, more satisfying educations which help to create a lasting relationship with the learning process after the student's formal education is complete. These methods typically include the alternative type approaches: Montessori, Open Education, Group and Collaborative teaching.
On the other side, some statistics indicate that certain students are not compatible with self-directed education. Because this diversity exists, schools, or teachers, need to employ a variety of instructional methods to meet the needs of the students under their care.

This study also concluded that the best shapes for classrooms were square, rectangular, or trapezoidal that could be modularly designed for future cost efficient expansion and still allow for a variety of arrangements inside the spaces.

Square footage requirements for a classroom facility were found to be 25-30 sq. ft. per student. Along with the preferred class enrollment of 20 students, the space size amounts to approximately 500-600 sq. ft.

Individual study spaces are an important element in many teaching approaches used today. Any classroom should be expected to have several students who learn more efficiently by themselves or in small groups. As our society continues to become more diversified, the need for more diverse teaching methods and spaces will increase. Along with the recent trends of technology use in the classroom (i.e., computers, video cameras, televisions, etc.) the square footage requirements for classrooms will probably increase to provide the necessary space for all the learning materials.

School administrators also need to be concerned with the upkeep of their learning environment. During the planning stages of the facility, low maintenance concepts need to be addressed so that budgetary issues aren't allowed to provide an excuse for certain maintenance needs to go unresolved because of
money issues. Children need a facility they can be proud of to maintain an interest in school. Data have indicated that some schools have enjoyed a 20 percent increase over normal achievement levels when they were the first students in a new facility (Graves, 1993, pg. 200). By maintaining school facilities to “like new” levels of upkeep, students may maintain higher levels of gratification in education.
# CLASSROOM ENVIRONMENT SCALE SCORING KEY

## Involvement

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Direction</th>
<th>Scoring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T</td>
<td>Students put a lot of energy into what they do here.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>Students day dream a lot in this class.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>F</td>
<td>Students are often &quot;clock-watching&quot; in this class.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>T</td>
<td>Most students in this class really pay attention to what the teacher is saying.</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>F</td>
<td>Very few students take part in discussions or activities.</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>F</td>
<td>A lot of students &quot;doodle&quot; or pass notes.</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>T</td>
<td>Students sometimes present something they've worked on in class.</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>F</td>
<td>A lot of students seem to be only half awake during this class.</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>T</td>
<td>Students sometimes do extra work on their own in this class.</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>T</td>
<td>Students really enjoy this class.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>T</td>
<td>Students in this class get to know each other really well.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>Students in this class aren't very interested in getting to know their students.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>T</td>
<td>A lot of friendships have been made in this class.</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>T</td>
<td>It's easy to get a group together for a project.</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>T</td>
<td>Students enjoy working together on projects in this class.</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>T</td>
<td>Students enjoy helping each other on homework.</td>
<td></td>
</tr>
<tr>
<td>Item Number</td>
<td>Direction</td>
<td>Statement</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>F</td>
<td>Student's don't have much of a chance to get to know each other in this class.</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>F</td>
<td>It takes a long time to get to know everybody by his or her first name in this class.</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>F</td>
<td>There are groups of students who don't get along in this class.</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>F</td>
<td>Some students in this class don't like each other.</td>
<td></td>
</tr>
<tr>
<td>Item Number</td>
<td>Direction</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>This teacher spends very little time just talking to the students..</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>T</td>
<td>The teacher takes personal interest in students.</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>T</td>
<td>The teacher is more like a friend than an authority figure.</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>T</td>
<td>The teacher goes out of his/her way to help students.</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>F</td>
<td>Sometimes the teacher embarrasses students for not knowing the right answers.</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>F</td>
<td>The teacher &quot;talks down&quot; to students.</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>T</td>
<td>If students what to talk about something the teacher finds time to do it.</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>T</td>
<td>This teacher wants to know what the students themselves want to learn.</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>F</td>
<td>This teacher does not trust students.</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>F</td>
<td>Students have to watch what they say in this class.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>T</td>
<td>Almost all class time is spent on the lesson of the day.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>T</td>
<td>Students are expected to stick to class work in this class.</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>F</td>
<td>We often spend more time discussing outside student activities than class-related material.</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>T</td>
<td>Getting a certain amount of class work done is very important in this class.</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>F</td>
<td>Students don't do much work in this class.</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>T</td>
<td>We usually do as much as we set out to do.</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>T</td>
<td>If a student misses class for a couple of days, it takes some effort.</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>F</td>
<td>This teacher often takes time out from the lesson plan to talk about other things.</td>
<td></td>
</tr>
<tr>
<td>Item Number</td>
<td>Direction</td>
<td>Feedback</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>F</td>
<td>This class is more a social hour than a place to learn something.</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>T</td>
<td>The teacher sticks to class work and doesn't get sidetracked.</td>
<td></td>
</tr>
</tbody>
</table>
### Competition

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Direction</th>
<th>Scoring</th>
<th>Real, Ideal and Expectations Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>F</td>
<td>Student's don't feel pressured to compete here.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>T</td>
<td>Students try hard to get the best grade.</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>T</td>
<td>Some students always try to see who can answer questions first.</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>F</td>
<td>Students don't compete with each other here.</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>T</td>
<td>A student's grade is lower if he/she gets homework in late.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>F</td>
<td>Grades are not very important in this class.</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>F</td>
<td>Student's here don't care about what grades the other students are getting.</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>T</td>
<td>Students have to work for a good grade in this class.</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>T</td>
<td>Sometimes the class breaks up into groups to compete with each other.</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>F</td>
<td>Students usually pass even if they don't do much.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>T</td>
<td>This is a well-organized class</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>T</td>
<td>Students are almost always quiet in this class.</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>F</td>
<td>Students fool around a lot in this class.</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>F</td>
<td>This class is often in an uproar.</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>T</td>
<td>The teacher hardly ever has to tell students to get back in their seats.</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>F</td>
<td>The teacher often has to tell students to calm down.</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>T</td>
<td>Assignments are usually very clear so everyone knows what to do.</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>F</td>
<td>This class hardly ever starts on time.</td>
<td></td>
</tr>
</tbody>
</table>
Real, Ideal and Expectations Form Scoring

Item Number  Direction

78  T Activities in this class are clearly and carefully planned.
87  T Students don't interrupt the teacher when he/she is talking.
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Direction</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>T</td>
<td>There is a clear set of rules for students to follow.</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
<td>Rules in this class seem to change a lot in this class.</td>
</tr>
<tr>
<td>25</td>
<td>T</td>
<td>The teacher explains what will happen if a student breaks a rule.</td>
</tr>
<tr>
<td>34</td>
<td>T</td>
<td>The teacher explains what the rules are.</td>
</tr>
<tr>
<td>43</td>
<td>T</td>
<td>The teacher makes a point to stick to the rules he/she has made.</td>
</tr>
<tr>
<td>52</td>
<td>F</td>
<td>Whether or not a student can get away with something depends on how the teacher is feeling that day.</td>
</tr>
<tr>
<td>61</td>
<td>T</td>
<td>There are set ways of working on things.</td>
</tr>
<tr>
<td>70</td>
<td>T</td>
<td>In the first few weeks the teacher explains the rules about what students could do or not do in this class.</td>
</tr>
<tr>
<td>79</td>
<td>F</td>
<td>Students aren't always sure if something is against the rules or not.</td>
</tr>
<tr>
<td>88</td>
<td>T</td>
<td>The teacher is consistent in dealing with students who break the rules.</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>There are very few rules to follow.</td>
</tr>
<tr>
<td>17</td>
<td>T</td>
<td>If a student breaks a rule in this class, he's sure to get into trouble.</td>
</tr>
<tr>
<td>26</td>
<td>F</td>
<td>The teacher is not very strict.</td>
</tr>
<tr>
<td>35</td>
<td>T</td>
<td>Students can get into trouble with the teacher for talking when their not supposed to.</td>
</tr>
<tr>
<td>44</td>
<td>F</td>
<td>Students don't always have to stick to rules in this class.</td>
</tr>
<tr>
<td>53</td>
<td>T</td>
<td>Students get into trouble if they are not in their seats when the class is supposed to start.</td>
</tr>
<tr>
<td>62</td>
<td>T</td>
<td>It's easier to get in trouble here than in a lot of other classes.</td>
</tr>
<tr>
<td>71</td>
<td>F</td>
<td>The teacher will put up with a lot.</td>
</tr>
</tbody>
</table>
80  T  The teacher will kick a student out of class if he/she acts up.
89  T  When a teacher makes a rule, he means it.
## Innovation

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Direction</th>
<th>Real, Ideal and Expectations Form Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>T</td>
<td>New ideas are always being tried out here.</td>
</tr>
<tr>
<td>18</td>
<td>T</td>
<td>What students do in class is very different on different days.</td>
</tr>
<tr>
<td>27</td>
<td>F</td>
<td>New and different ways of teaching are not tried very often in this class.</td>
</tr>
<tr>
<td>36</td>
<td>T</td>
<td>The teacher likes students to tried unusual projects.</td>
</tr>
<tr>
<td>45</td>
<td>F</td>
<td>Students have very little say in how class time is spent.</td>
</tr>
<tr>
<td>54</td>
<td>T</td>
<td>The teacher thinks up very unusual projects for students to do.</td>
</tr>
<tr>
<td>63</td>
<td>F</td>
<td>Students are expected to follow set rules when doing their work.</td>
</tr>
<tr>
<td>72</td>
<td>T</td>
<td>Students can choose where they sit.</td>
</tr>
<tr>
<td>81</td>
<td>F</td>
<td>Students do the same kind of homework almost every day.</td>
</tr>
<tr>
<td>90</td>
<td>T</td>
<td>In this class, students are allowed to make up their own projects.</td>
</tr>
</tbody>
</table>

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
APPENDIX 2
Creating an Effective School Learning Environment

Criteria checklist:

- The school allows for flexibility in teaching activities.
- The spaces in the schools are located in areas that facilitate student movement and use of related areas.
- The school permits individual, small group, and large group instructional activities.
- The school has been especially designed to accommodate technological support for learning.
- The school is aesthetically pleasing in both its outside and inside environments.
- The school is designed as a safe and healthy environment.
- The school is designed to accommodate all types of handicapped individuals.
- Visual control, acoustical control, and climate control are efficient and easy to operate.
- The school is designed to be maintenance free or for minor maintenance upkeep.
- State of the art instructional designs have been incorporated into the specialized areas of the arts, vocational and occupational programs, sciences, languages, special education, physical education, computer and technology, and multimedia. Each area has very adequate storage and workspace.
- At the middle school and high school levels, gymnasiums, auditoriums, and music wings are property space coordinated; and the vocational and art areas are also located by their related spatial areas.
- Corridors, lavatory facilities, and locker areas are located in unobtrusive, but easily accessible locations.
- Classrooms have adequate storage areas for teachers' and students' materials.
- Classrooms are designed to accommodate the individuality of students and of teachers.
• Classroom size and design foster flexibility and a variety of teaching activities.

• Classrooms promote positive social interaction between and among students.

• The entire school site and school building, as well as the individual instructional spaces, promote a positive learning, teaching, and working environment.

(Adapted from “Effective School Facilities,” by Jerry Herman)
REFERENCES


VITA

Graduate College
University of Nevada, Las Vegas

Merrill Kieffer

Address:
3125 West Warm Springs
Henderson, Nevada 89014

Degrees:
Bachelor of Science, Architecture, 1992
University of Nevada, Las Vegas

Special Honors and Awards:
Phi Kappa Phi Honor Society, 1991
Graduated Magna Cum Laude, 1992

Thesis Title: Teaching Methods and School Designs of American Elementary Schools and How the Methods are Reflected in the Schools' Designs

Thesis Examination Committee:
Chairperson, Attila Lawrence, Professor of Architecture
Committee Member, Michael Alcom, Director, School of Architecture
Committee Member, Eric Anderson, AIA, Director of Planning and Construction
Graduate Faculty Representative, Marilyn McKinney, Associate Professor of Literacy Education

129