DECEMBER 2004

PERSPECTIVES OF SCHOOL PLANNERS AND ARCHITECTS AND PROFESSIONAL EDUCATORS REGARDING ELEMENTARY SCHOOL FACILITY DESIGN CHARACTERISTICS

by

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ABSTRACT

The purpose of this study was to collect and examine the perspectives of elementary school facility planners and architects, elementary school teachers, school district superintendents, and elementary school administrators regarding three progressively specific sets of school facility design characteristics and their influence on elementary education. These design characteristics included: six general design principles produced by the US Department of Education, 33 previously published broad education design principles, and 86 specific complementary design characteristics found in the Design Assessment Scale – Elementary (DASE) produced by the University of Georgia's School Design and Planning Laboratory.

An electronic questionnaire, Perspectives of School Planners and Architects and Professional Educators Regarding Elementary School Facility Design Characteristics, was designed and distributed to educational professionals and elementary school facility planners and architects across the United States to gather information regarding their perspectives related to the three designated sets of design characteristics.

By reporting where differences in perception exist among educators, planners and architects concerning the importance of school design characteristics, as well as their magnitude,

the results of this study are expected to be helpful in underscoring and conveying the importance of the school environment. This will be of value to those that plan, develop, and use the learning environment. The analysis of the collected survey data indicated that there were statistical agreements among the four designated respondent groups regarding many of the selected categories of design principles. However, seven categories in which the perspectives of these four groups of professionals differed significantly were identified. These categories were: (a) involving stakeholders in the design process; (b) providing adequate health, safety, and security; (c) making effective use of all available resources; (d) employing specific design principles for primary education spaces; (e) recognizing the need for public areas; (f) understanding the importance of movement patterns; and (g) designing instructional neighborhoods.

INDEX WORDS: School facilities planning, School design standards, School learning environments, Design principles, Educational environment, School buildings, School facility design

Study Release Date: This study will not be released to outside agencies until 2009 so that the SDPL may complete the research related to this subject area. Citations of the findings are certainly welcomed.

CHAPTER 1

INTRODUCTION TO THE PROBLEM

> "To live in an environment that has to be endured or ignored rather than enjoyed is to be diminished as a human being."
>
> -Sinclair Gauldie

Problem and Purpose of the Study

One area of thought in educational leadership and planning often overlooked is that the physical design and organization of the learning environment can have a profound impact on the success of the students and faculty of a school (Brubaker, 1998; Dejong, 1997; Tanner & Lackney, In Press; Taylor, Aldrich, & Vlastos, 1998; Stricherz, 2000). One concern arising from this perspective is that if the design of the learning environment influences student outcomes, based on research findings such as those reported by Weinstein (1979) for example, are there significant differences among educators, planners and architects concerning its importance? Given these concerns, the problem for this study was the literature does not reveal the possible different perspectives of educators, planners and architects regarding the importance of school design characteristics. If differences exist, then knowing where they lie and their magnitude will be helpful in communicating the importance of the school environment to those that plan, develop, and use the learning environment.

Therefore, the purpose of this study was to collect and examine the perspectives of elementary school facility designers, elementary school teachers, school district superintendents, and elementary school administrators regarding three progressively specific sets of school facility design characteristics and their influence on elementary education. These design characteristics included: six general design principles produced

by the US Department of Education (1999), Lackney's 33 broad design principles (Tanner & Lackney, In Press), and the School Design and Planning Laboratory 's (SDPL's) 86 specific complementary patterns found in the Design Assessment Scale – Elementary (DASE) principles (University of Georgia School Design and Planning Laboratory, 2000).

By focusing attention on the learning environment design characteristics and principles as active and vital components of student and teacher success, it was hypothesized that this study could provide benefits to other researchers, designers of educational facilities, district level planners, and school level leaders and elementary teachers in a way that might reach more than just the readily apparent concerns of money, time and materials. It might also serve to increase understanding of how and why the physical design of an educational facility could also be extremely important for the individual learner and teacher in many affective, behavioral, and cognitive areas. The link between student achievement and school facilities and environment has begun to receive more attention by researchers in recent years. The research at this point does not correlate rises in student achievement to improved facilities, it does, however, tell us that student achievement seems to be lower in sub-par facilities (Stricherz, 2000).

Educators are increasingly being held accountable for student achievement and growth as determined by a myriad of tests and data, but not much is being acknowledged, reported, or legislated regarding the buildings and learning environments where the educational process is housed. Educators are directed to leave no child behind academically, but the question of where they are not to leave the children behind with respect to the physical environment is overlooked. The surroundings and the

environments in which teachers and students find themselves certainly may influence the ways in which they teach and learn.

The status of many of our current school facilities is well accentuated by Taylor, Aldrich, and Vlastos (1998):

> Seating students in rigid rows, insisting on constant surveillance, staffing schools with narcotic agents and guard dogs, or surrounding the school with a chain-link fence are only preparing students for a police state - not for a democracy. If Americans value their freedom, and if schools are here to support the needs of society, - not solely to determine them- then we need to rethink the architectural, pedagogical aura of our schools. (p. 33)

There are indications in the literature that the educational environment in which human beings learn does indeed have a definite influence on a child's learning processes and growth in the areas of affective, behavioral, and cognitive development. Dejong stated that the physical layout and design of a school could enhance certain instructional strategies, discourage others, and have a significant impact on discipline (Dejong, 1997).

As designers, architects and school administrators develop future schools and learning spaces for our growing school age populations, the process of designing and building facilities based on the intended curricular programs, attending populations, and available technologies should be the main guide to the design of these learning spaces. In basic terms, form should follow function in that the facilities should be designed to fit the intended curriculum and uses, not the other way around. Unfortunately, the way the majority of our school facilities are currently designed and built is not in keeping with this simple philosophy. While this knowledge base is growing, it is still a reality that most educational systems and building groups do not yet subscribe to this idea, instead opting for standardized designs for new school facilities.

One of the largest monetary investments we make in our educational systems is found in the brick and mortar of the physical structures that house the educational process. These facilities should be well designed and planned to enhance the individual curriculums and support the teaching and learning that is enacted within their walls. Otherwise it seems to be a great expenditure of time, effort and funds to attempt to shoehorn curricular programs into generic shells that were not designed to be advantageous to begin with.

Spending on the renovation and new construction of educational facilities is currently reaching an all-time high. Spending on school construction increased by 8.4% to an estimated total of $52.9 billion over the 2001-2002 school year according to the U.S. Census Bureau's 2002 report released in June of 2004. This percentage of growth regarding spending on construction is higher than the reported 5.8% increase in overall school spending for the same period of time (US Census, 2004). Increasing enrollment and the No Child Left Behind legislation and the various related state level projects are furthering pressures regarding smaller class sizes and increased educator accountability, while continuing to put pressures on our current facility capacities as well as fueling the need for more facilities. This, along with the condition of the US economy and its negative effect on funding for school programs in general, makes the need for advantageous, program-based planning of our educational facilities even more necessary and immediate.

A well-designed and planned school encourages and supports better student performance and makes a strong statement to the community at large regarding the importance of education. Unfortunately, security issues for students and staff are often

hindered by design problems. It is the responsibility of those involved in the design process to make sure this important element is taken into account whenever there is planning for a new facility or renovations for an existing building.

Safety from intruders and security from outside disruptions must be taken seriously as one of the very a basic elements of school design. In our nation's post-911 climate two of the primary security issues that most school level administrators worry about center on unauthorized people gaining access to our school buildings and the surveillance of areas of the school that may have escaped notice even five years ago. Building designs that include confusing corridors, hidden areas and niches, multiple blind corners, hallways that dead end, obscured outside walkways, and multiple points of entry to halls and classrooms are obvious safety and security weakness points. Security for student, staff, and visitor parking areas is also often overlooked. Another frequently overlooked design safety element is the idea that drop-off points for car riding students should be well separated from the area in which students are unloaded from school busses.

School leaders and facility designers should begin to better understand and provide closer scrutiny regarding the areas of security, cost, environmental hazards and site selection as well as understanding that the facility should be designed with the curriculum in mind. The facility and grounds should support and enhance the curriculum. This is crucial as we continue to build schools at an ever-increasing rate for our rapidly growing school age populations. All of these functions can be designed into our future school buildings as extremely advantageous design elements if a wider understanding of what is positive practice for educational facility design can be defined and promoted.

There is a limited amount of research currently being conducted in the area of facility design and its effects on faculty and staff. The stresses that teachers and staff are exposed to on the job are of concern to educational leaders and researchers throughout the world. Teachers leaving the field of education for other careers within the first five years had reached levels of 50% in the state of California by 1990 (Estes, Stansbury, & Long, 1990). Much of this is attributed to low job satisfaction and high stress levels. Poor working conditions and student misbehavior (Borg & Riding, 1981) as well as poor attitudes and lack of resources (Dewe, 1986) are seen as contributing factors to this career dissatisfaction.

Much of this problem was summarized by Taylor, Aldrich, and Vlastos (1998):

> There are a number of environments in which children must spend a large share of their time. Some of these are antagonistic, hostile or incompatible to self-expression. In this regard, the American school leaves little room for a sense of ownership or involvement. Students have very little to say, and are rarely asked for their opinions, about their school's physical characteristics. In its present state, the architecture and physical setting of most American schools is deplorable. It almost always follows the passive "egg crate" closed classroom format of 200 years ago, and all too often it is more like a prison than a place of discovery, wonder and creativity. (p. 31)

Rationale

On a basic level, human beings relate to their world through the function of a combination of five senses (Gonzalez-Crussi, 1989). These senses are the ways in which all human beings experience their world in some form or another or to some degree or another. Regarding the school environment these senses are continuously at high levels of stimulation. Examples include:

- Sight - visual elements such as colors, room decorations, equipment, and furniture.

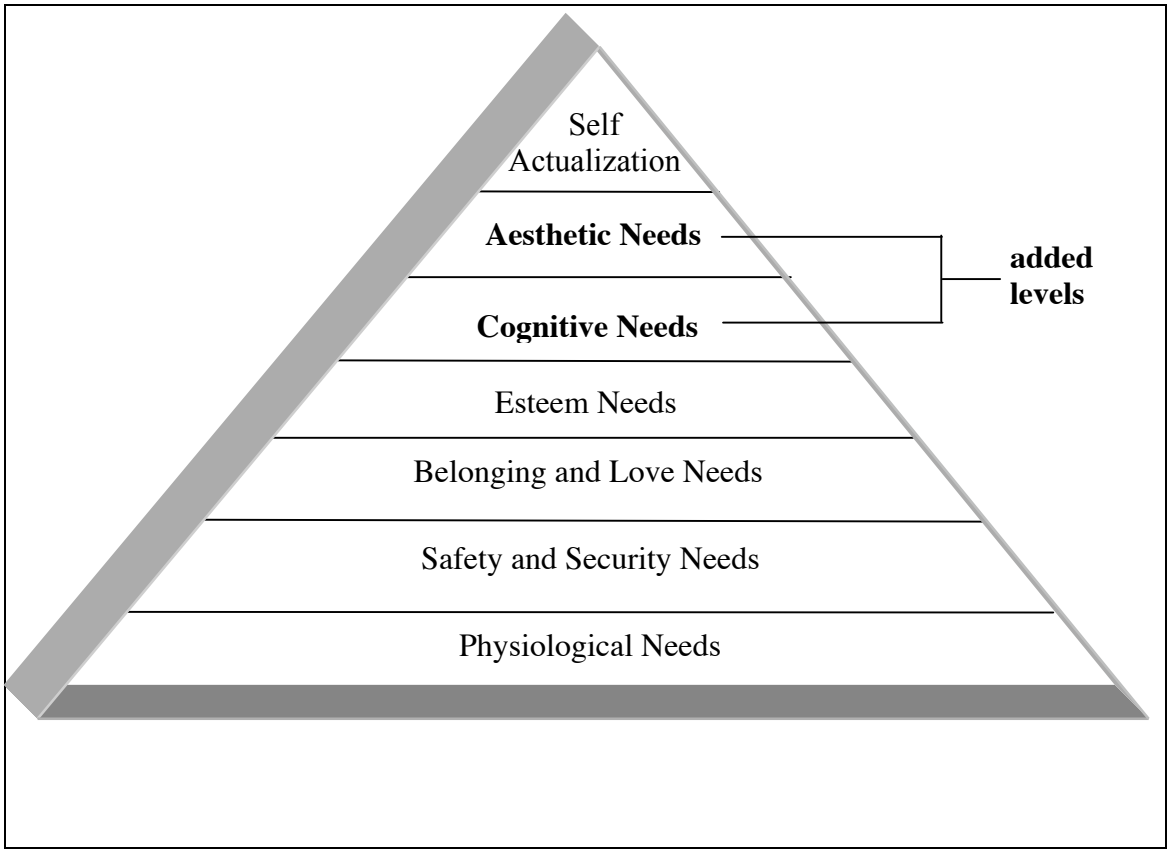
- Smell - Olfactory elements such as smells from the kitchens, locker rooms, heating systems, and nearby industries.
- Touch - Textural elements form the buildings and furniture, playground equipment and school grounds.
- Hearing – Auditory experiences including the way things sound in different environments such as carpeted and tiled, outside noise levels, noise from other classes, fire alarms and bells.
- Taste – Certain tastes can transport one back to school days almost immediately – yeast rolls, small cartons of milk, nutty buddy ice cream cones, and government cheese products come immediately to mind.

One accepted education psychological theories that parallels how people experience their world is found in Maslow's Hierarchy of Needs. Maslow's hierarchy is normally represented as a pyramid with five levels that range from the most basic human needs at the bottom to the most complex and sophisticated at the pinnacle (Maslow, 1998). From bottom to top, the levels are: 1 - physiological needs such as food, water, and shelter, 2 - safety, 3 - belongingness and love, 4 - the need to be esteemed by others, and 5 - self-actualization or the need to realize one's full potential. Maslow also later added levels dealing with cognitive issues (to know, to understand, and explore) and aesthetics, (symmetry, order, beauty, sense of scale, color perception, overall sensory harmony, and intent). As shown in Figure 1, these levels were inserted between level four, the need to be esteemed by others, and level five, self-actualization (Maslow, 1998).

Maslow believed the needs at each level must be met before a person can progress to the next level. His theory informs educators that a learners' preoccupation with any of

the lower four levels will always supercede concentration on the processes involved with learning. The framework for this study can be related to this hierarchy in that the environment or space that the human learner is situated can be directly tied to the levels below that of self-actualization in Maslow's pyramid, i.e. the levels of biological needs, safety, belongingness, cognitive issues, and aesthetics.

Figure 1. Representation of Maslow's Hierarchy of Needs Pyramid with Added Levels.



If designers of school facilities and learning spaces create with these areas in mind, from the beginning, then the learners should have a much easier time reaching the higher levels as a large amount of these preoccupations will be met when they enter the school facility/learning environment. This is not to say that a well designed educational

facility can, or should, deal with all of the issues found in the hierarchy that may be a negative influence on a learner's life and ability to learn. It would be unrealistic at best to argue that a building or educational environment can mitigate the issues that all human beings bring with them from outside. However, well designed facilities and environments can enhance and strongly influence the learning process in a positive manner and should never provide negative influence on or interference in the teaching and learning processes they are designed to house. This human psychological and educational theory supporting the idea that the physical design and setting of our school facilities is of high importance on a basic level. How can we treat these facilities and their designs as secondary concerns, if at all? In a sense, those of us involved in building school facilities literally shape the buildings that help to shape our society.

As research points out, (Dejong, 1997; Taylor, Aldrich, & Vlastos, 1998; Stricherz, 2000) the surroundings and environment in which students find themselves may exert influence on the ways in which we learn. It also seems that the morale and quality of work of the educational staff may be directly related to the influences and conditions of the environment in which they work (Borg & Riding, 1981). The classrooms and facilities in which students learn and teachers teach may be a very important factor during educational growth and development and should be treated as an active tool to improve and support these processes. Taylor, Aldrich, and Vlastos (1998) stated that the environment of the school itself has large and untapped potential as an active contributor to the overall learning process.

The school building is one prominent type of building in which a high percentage of citizens from all walks of life, ethnicities, genders, and religious backgrounds in the

United States spend a large amount of time. These facilities and their designs should therefore be high on the list of concerns when professionals look for ways to improve and enhance student achievement. Educational leaders should be highly concerned to make sure the facility they develop and manage is as safe, cost efficient, functional, and supportive of the educational process as possible. Unfortunately, more often than not, school building level leaders have very limited input into the actual design process, even when they are assigned to new facilities (U.S. Department of Education, 1999; U.S. Department of Education and Justice, 1998, August; Crowe, 1991; Garbarino1980).

Procedures

This project sought to put less emphasis on the "what" of budget considerations, schedules, construction hurdles and the like, and focus more on the "why" of exploring the reasons we need to build school facilities in a way that provides positive and lasting environmental effects on the teachers and learners that spend a large portion of their lives within.

The procedural model for this project was based around the review of previously determined school facility design principles - six general design principles produced by the U.S. Department of Education (1999), 33 broad design principles (Tanner & Lackney, In Press), and 86 elementary K-5 specific design principles (University of Georgia School Design and Planning Laboratory). These design principles were linked together in a way that meshes them together in an organized and comprehensive way from the broadest set of design principles to the most detailed (see Appendix C).

An electronic questionnaire, Perspectives of School Planners and Architects and Professional Educators Regarding Elementary School Facility Design Characteristics (see

Appendix A) was designed and distributed to educational professionals and elementary school facility planners and architects across the United States and Canada to gather information regarding attitudes and perspectives related to the three designated sets of design principles. Feedback from this questionnaire was statistically analyzed with results presented in Chapter 4.

It was the goal of this study to collect, analyze, and report the research and professional educators and school facility designers regarding the impact and influence on student learning and education. Given the problem of lack of information regarding the perspectives of design, the following null hypothesis was developed to guide this study. H0: There is no statistically significant difference among the perspectives of planners and architects, elementary school teachers, and school leaders regarding the importance of school design. To test this hypothesis a set of research questions were formulated.

Research Questions

1. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the six National Design Principles (α = .05)?
2. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of Lackney's 33 Broad Design Principles (α = .05)?

3. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the 86 Design Appraisal Scale-Elementary Principles ($\alpha = .05$)?

Limitations

The following limitations in regards to this study were accepted:

1. The results of this descriptive study will not provide definitive inferences, but only add to the knowledge base with information to aid in establishing a firm basis for decision-making in the area of the design of elementary school facilities.
2. Three levels of school stakeholders were not included in the pool of participants – students, parent/guardians of students, and other community members such as business partners.

This project attempted report and understand the perspectives of the individual school facility planner and architect, elementary school teacher and administrator, and district superintendent regarding the elementary school environment. As noted earlier, this study may help to support the idea that well designed facilities and school environments can enhance and strongly influence the learning process in a positive manner and should never provide negative influence on or interference in the teaching and learning processes they are designed to house.

Definitions of Terms

For the purpose of this study, the following definitions were used:

Activity Pockets - spaces designed specifically for small group work.

Administration Centralized - Administrative offices are grouped together in a centralized area allowing for connection and convenience. If there are schools within a school or a campus plan, the person in charge should be readily accessible.

Animal Life - places in a school or on the school grounds for animals to live (such as butterfly houses, bird houses, trees, small animal pens, etc…). Caring for animals helps teach the students a sense of responsibility and respect.

Architectural Reference - Main building has an obvious point of reference among the school's buildings. It is a focal point where paths and buildings connect. This design feature heightens the sense of community.

Background Detail - spaces for colorful displays on walls and doors (such as light switches, wall outlets, louvers, and surface raceways) that might normally be unnoticed by adults.

Building on Student's Scale - how a facility is designed and built to the scale of children (such as door handles or handrails low enough for children to reach to accommodate their heights, sinks lowered to accommodate children, etc.).

Circulation Patterns - spaces for indoor circulation should be broad and well-lit allowing for freedom of movement.

Context within Surroundings -- the way in which the school and grounds are compatible with the surroundings and sufficient to facilitate the intended curriculum and programs.

Entrance Area – A friendly space connecting the outside world to the inside world. This age appropriate space should be inviting and highly visible for students and visitors. It should evoke a welcome feeling.

Harmony with Natural Surroundings - the way in which the facility blends with the surroundings or is "in harmony" with its setting.

Hearth Area - place used for reading and quiet time.

Instructional Neighborhoods - areas that include teacher planning spaces, flex zones (places for multiple use), small and large group areas, wet areas for science and art, hearth areas, and restrooms.

Intimacy Gradients - A sequence from larger to smaller - public to private spaces, giving the effect of drawing people into the area. These are usually found in main entrances, but may be used through out the learning environment.

Living Views - views of indoor and outdoor spaces (gardens, animals, fountains, mountains, etc.) These allow minds and eyes to take a break.

Movement Patterns - how the design helps or hinders the ways in which people enter and move about, around, and within a facility.

Natural Light/ Full Spectrum - artificial light plus natural light from the outside, preferably on two sides of every room.

Outdoor Rooms -defined spaces outdoors that are much like an indoor classroom.

Outdoor Places -places that are defined by design elements such as wings of buildings, hedges, fences, arcades, or walkways.

Outside Places - adequate outside areas for children to sit, play, and socialize.

Overlooking Life - views of activities or "what's going on" in the areas outside the student's immediate location. This helps to ground the location in the overall community.

Paths with Goals - Places designed to provide focal points when walking to particular locations (such as displays of students' work, important posters and signs, benches, or plants).

Private Spaces - supervisable areas where small groups of students may go to be alone. Examples may include reading, quiet, or reflection areas.

Promenades -walkways that link main outside areas. Ideally these would place major centers/hubs of activity at the extreme ends.

Public Areas - spaces that foster a sense of community or unity and belonging that put forth an inviting and comfortable setting.

Territoriality of Place - comfort levels for students in regards to personal and social distances.

Overview of the Study

Chapter 1 set forth the introduction and purpose of the study, the research questions, the framework and rationale for the study, the definition of important terms, and the significance of the study. Chapter 2 presented a review of related literature using three levels of design principles as an organizational map. Chapter 3 presented the developed methodology and the statistical treatments used to analyze the data from the researcher-developed questionnaire. Chapter 4 reported the study findings related to the analyzed survey data. Chapter 5 summarized the study findings, presented conclusions, implications, and recommendations to be considered for future research.

Summary

It was the aim of this study to examine the idea that an understanding of how and why the design of an educational facility might or might not be important for the success of the individual learner and teacher. This success possibly might be supported or enhanced in ways that could influence more than just the readily apparent concerns of money, time, and materials. By focusing attention on the learning environment from the perspectives of educational professionals and school facility planners and architects regarding design characteristics, the results of this study may provide benefits to other researchers, designers of educational facilities, planners and architects, district level leaders, and school level leaders and teachers.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

The focus for this project was based on the review of three levels of published school facility design principles - six general design principles produced by the US Department of Education (1999), Lackney's 33 broad design principles (Tanner & Lackney, In Press), and the School Design and Planning Laboratory 's (SDPL's) 86 specific complementary patterns found in the Design Assessment Scale – Elementary (DASE) principles (University of Georgia School Design and Planning Laboratory,

2000). These three categories provided the general format for organizing the review of literature for this study (see Figure 2).

The U.S. Department of Education's Six General Design Principles

A group of school facility planners and architects, educators, governmental leaders, and interested citizens were commissioned in 1998 by the U.S. Department of Education to begin discussion revolving around a process of planning and designing schools that would best meet students' educational needs as also serve as community centers. The product of that work was the first draft of a list of six design principles for educational environments. These six principles were finalized and went on to gain the endorsement of the American Institute of Architects, the American Association of School Administrators, the Construction Managers Association of America, and the Council of Educational Facility Planners International. These broad principles can be seen as a basis for people involved in the design and building of the nation's educational facilities to begin designing learning for the 21st century (US Department of Education, 1999).

Lackney's 33 Broad Design Principles

In a work entitled "Thirty-three Educational Design Principles for Schools and Community Learning Centers" sponsored by the National Clearinghouse for Educational Facilities (NCEF) by Lackney updated in 2003 and subsequently used as a basis for chapter two of a forthcoming book, *Educational Facilities Planning: Leadership, Architecture, and Management* by Tanner and Lackney, Lackney sets forth a series of 33 design principles. Lackney describes the basis for these principles as follows (2003):

> These principles are derived from a variety of sources: from the reflective practice of educators and design professionals to the empirical research of environmental psychologists and educational researchers. Each educational design principle takes as an underlying premise that all

> learning environments should be learner-centered, developmentally- and age-appropriate, safe, comfortable, accessible, flexible, and equitable in addition to being cost effective. These premises run through all principles and should be understood to moderate the appropriateness of each principle in practice. (p. 1)

The SDPL's 86 Specific Design Principles – DASE

Since 1997, the University of Georgia's School Design and Planning Laboratory (SDPL) has focused on conducting research with the goal of exploring and improving the physical environments of schools in relation to the learning process. The Design Assessment Scale for Elementary Schools (DASE) has been constructed and modified by the SDPL to assist facility planners and architects and educators, in the planning and designing of developmentally appropriate learning environments for elementary school facilities and to attempt to delineate specific links between student learning, behavior, attitude, self-concept, and the school's physical environment. The primary academic work influencing the development of the design scale is credited to Alexander, Ishikawa, and Silverstein (1977). This instrument has been used to assess and evaluate existing design patterns of schools in various studies conducted by the SDPL and graduate students associated with the laboratory. The DASE consists of a total of 86 specific design principles (see Appendix D) that have been grouped into eleven sub-scales. These subscales were organized by Yarborough in an unpublished doctorial dissertation (2001) based on works by Alexander, et al (1977), Taylor, Aldrich, and Vlastos (1998), Lang (1996), Anderson (1999), and Ayers (1999). These eleven subscale groupings are: Movement Patterns, Large Group Spaces, Architectural Layout, Daylighting and Views, Color, Scale of Building, Location of School Site, Instructional Neighborhoods, Outdoor Environments, Instructional Laboratories, and Environmental Conditions. For the

purpose of this study it is assumed that the Design Appraisal Scale-Elementary is valid and reliable based on research by Tanner (2000a).

Each of the following six sections will contain a review of pertinent literature related to each major heading and secondary subheadings. The more narrow subheadings pulled from the 86 specific design principles of the SDPL will be presented in list form to limit redundancy of the information presented. The three levels of design principles were grouped according to a funneled hierarchy established and illustrated in the organizational chart and outline (see Figure 2).

Figure 2. Organizational Chart for the Review of Literature

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Design
Assessment
Scale for
Elementary
Schools –

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CHAPTER 3

METHODS AND PROCEDURES

Introduction

This chapter includes a review of the research questions and the research design outline as well as the individual phases conducted in the course of the study. It presents an overview of the survey process, participants, and sample selection, followed by methods of data collection, analysis, and statistical treatments used.

Procedures and Methodology

Given the problem of lack of information regarding the perspectives of design, the following null hypothesis was developed to guide this study. H0: There is no statistically

significant difference among the perspectives of planners and architects, elementary school teachers, and school leaders regarding the importance of school design.

To test this hypothesis three research questions were formulated to guide the analysis:

1. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the six National Design Principles ($\alpha = .05$)?
2. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of Lackney's 33 Broad Design Principles ($\alpha = .05$)?
3. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the 86 Design Appraisal Scale-Elementary Principles ($\alpha = .05$)?

Research Outline

The research design of the study involved four distinct phases. Each of the first three phases informed the phase following. The four phases were:

Phase 1: Literature review.

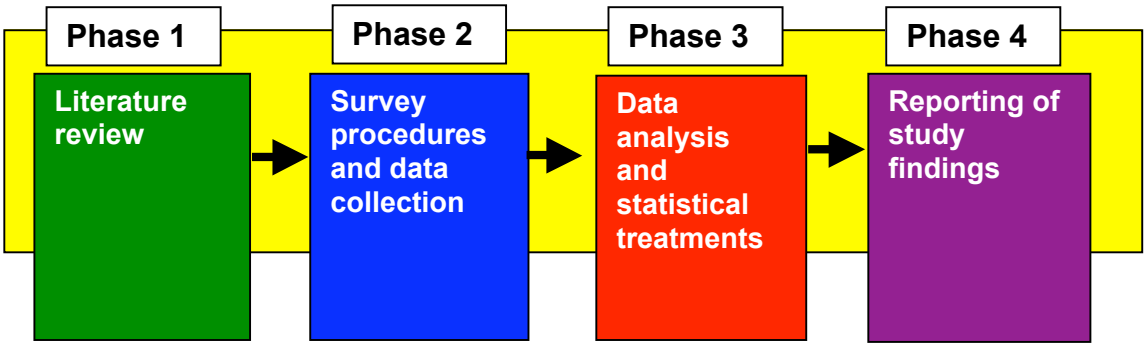
Phase 2: Survey procedures and data collections.

Phase 3: Data analysis and statistical treatments.

Phase 4: Reporting of study findings.

Figure 3 provides a graphic overview of the phases of the research design.

Figure 3. Graphic Overview of Research Phases



Phase 1: Literature review.

The three sources of design principles were organized according to best fit and flow from broad to specific (see Figure 2). They were organized around the six general design principles produced by the US Department of Education (1999), the 33 broad design principles assembled by Lackney (Tanner & Lackney, In Press) and the 86 specific design principles produced by the SDPL (2000). Articles that addressed the effects and influence of physical school facility conditions and design elements on students, staff and stakeholders and other building occupants were secured from the literature in the areas of educational curriculum, human psychology, environmental and behavioral studies, architecture, and other sources as applicable. Each article or dissertation was read carefully and reviewed in relation to the applicable design principle or principles.

Phase 2: Survey procedures and data collection

Participants

The study consisted of a random sample of school facility planners and architects, elementary teachers and administrators, and district level superintendents from across the United States and Canada (see Table E.5 in Appendix E for a breakdown of respondents by state or country). One stipulation was that all participants had to have a functional email address and access to the Internet to participate. Four thousand email addresses were randomly selected from State Department of Education, school district, and elementary school websites. An introductory email (see Appendix F) was sent to each potential participant that included a link to the online electronic questionnaire (see Appendix A). Of these 4000 preliminary invitations 1232 were electronically returned due to various reasons, resulting in 2768 valid invitations.

Out of the 2768 valid survey invitations sent 1116 participants actually viewed the survey. Of those 1116 viewed surveys, 686 respondents started the survey. Out of this 686 who started the survey, 224 dropped out at some point during the survey and 462 completed the entire survey. Started and completed surveys were inspected for percentage of completion and duplication of submissions. If a respondent had completed 50% or more of the pertinent questions the survey was counted as valid. Out of the 686 original started surveys, 202 were discarded, yielding a total of 484 useful surveys (See Table 3.1).

Table 3.1

General Survey Response Statistics

Average time taken to complete: 21 minute(s)	
Completed Responses	449
Started	484
Drop Outs (After Starting)	35
Survey Views	1116

Instrumentation and Data Collection

The Perspectives of School Planners and Architects and Professional Educators Regarding Elementary School Facility Design Characteristics survey (see Appendix A) was used to assess each group of respondents' perspectives regarding the importance of three levels of school facility design principles. The survey was developed based on a review of literature pertaining to elementary school facility design principles and was accessible and completed solely on the Internet and through electronic mail. No paper mailings were used although the option was available and offered to the survey invitees upon their request. The electronic survey responses were updated in real time and participants were able to view results after completing the survey by accessing the results webpage via a hyperlink that was provided to them after they had completed the survey.

The majority of survey questions were grouped according to each of the three levels of design characteristics discussed in the review of literature to ascertain the respondents' level of perceived importance of each design characteristic or principle. A five point Likert type scale followed these questions with the exception of the six US

Department of Education principles where respondents were asked to rank them according to importance. The Likert type scale asked participants to rate each question on the following scale:

1 = Highly Important
2 = Very Important
3 = Neutral
4 = Not Very Important
5 = Absolutely Unimportant

Demographic and general attitude and interest level questions were included as well. The last two questions were open-ended, allowing participants to list additional ideas or areas that they felt were important to elementary facility design and to offer comments. The responses to the open-ended questions were also collected and presented in Appendix I.

After 10 days a reminder was sent to those invitees who had not yet viewed the survey. A second reminder was sent out 12 days after the first reminder. After a total of 48 days the survey website was deactivated and the electronically gathered and tabulated data were downloaded for analysis. The results of this analysis are presented in Chapter 4.

The participants were asked to provide demographic information regarding their current position as a school planner or educational professional, the number of years experience in that field, highest educational level completed, age group, gender, state or country of residence, and membership in professional organizations. This demographic information, current position in particular, served as variables to be examined.

Phase 3: Data analysis and statistical treatment

All data were gathered and analyzed electronically. The collected data, including demographics, were first reported by a frequency analysis for each question. The two large groups of design principles, Lackney's 33 broad design principles and the SDPL's 86 specific principles, were divided into five category subscales and 14 category subscales respectively according to classification. Reliability and consistency for these subgroups of survey items were assessed using Cronbach's alpha.

To provide descriptive findings for each of the designated research questions, the Statistical Package for Social Sciences (SPSS) was then used to produce a descriptives analysis, tests of homogeneity of variances, a one-way analysis of variance (ANOVA), and Scheffe' Tests for each group of results. These results are presented in Chapter 4. A significance level of .05 was used to make decisions regarding the acceptance of the null hypothesis. The hypothesis was ultimately accepted or rejected based on the results of the post hoc Scheffe' Test. If there was any statistically significant difference indicated among the groups, the null hypothesis was rejected. The .05 level was chosen instead of the .01 level because the data reported perspectives to be used for discussion. A Type II error would be considered more of a negative influence on the study results than a Type I error in this case.

Phase 4: Reporting of study findings

A discussion of summarized study findings and conclusions is presented in Chapter 5. Potential implications and recommendations for future research are also presented.

Summary

The contents of this chapter reviewed the main hypothesis and research questions, presented the individual phases conducted in the course of the study, and described the methods and procedures used to collect and analyze data for the study. These procedures included the survey process, participant selection, and statistical treatments used. The information presented in this chapter was the basis for formulating descriptive findings for the stated research questions.

CHAPTER 4 Omitted for this Internet publication

CHAPTER 5

SUMMARY OF FINDINGS, IMPLICATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

Introduction

This chapter presents a summary of the study as well as a review of the research findings presented in Chapter 4. Findings regarding the designated research questions are presented and recommendations and implications for further research are included.

Summary of the Study

As stated in Chapter 1, the purpose of this study was to collect and then examine the perspectives of elementary school facility planners and architects, elementary school teachers, and elementary school administrators regarding three progressively specific sets of school facility design characteristics and their influence on elementary education. These design characteristics included: six general design principles produced by the US

Department of Education (1999), Lackney's 33 broad design principles (Tanner & Lackney, In Press), and the School Design and Planning Laboratory 's (SDPL's) 86 specific complementary patterns found in the Design Assessment Scale – Elementary (DASE) principles (University of Georgia School Design and Planning Laboratory, 2000).

Given the problem of lack of information regarding the perspectives of design, the following null hypothesis was developed to guide this study. H0: There is no statistically significant difference among the perspectives of planners and architects, elementary school teachers, and school leaders regarding the importance of school design.

To explore this problem the following research questions were formulated:

1. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the six National Design Principles ($\alpha = .05$)?
2. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of Lackney's 33 Broad Design Principles ($\alpha = .05$)?
3. Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the 86 Design Appraisal Scale-Elementary Principles ($\alpha = .05$)?

The feedback gathered from survey participants associated with this study indicated that there were indeed some marked differences between the perspectives of school facility planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of a majority of the three progressively specific sets of school facility design characteristics and their influence on elementary education. This is especially important as spending on the renovation and new construction of educational facilities is currently reaching an all-time high. Spending on school construction increased by 8.4% to an estimated total of $52.9 billion over the 2001-2002 school year according to the U.S. Census Bureau's 2002 report released in June of 2004 (US Census, 2004).

Findings for Research Question 1:

Research Question 1 asked, "Is there a significant statistical difference among the perspectives of planners and architects, elementary teachers, elementary school administrators, and school superintendents regarding the importance of the **six National Design Principles** ($\alpha = .05$)?" The test of homogeneity of variances of the data set presented in Chapter 4 showed that there were statistical relationships among the four respondent groups regarding four of the six National Design Principles (see Table 4.7).

The subsequent ANOVA revealed that there were differences in three of the six National Design Principles (see Table 4.8). The subsequent post hoc statistical analysis using the Scheffe' Test of the three variables indicated by the ANOVA revealed the following three significant differences among the four respondent groups:

Involve Stakeholders in the Design Process - There was a difference between planners and architects and the remaining three respondent groups (see Table 4.9), with

the planners and architects viewing this area as significantly more important than the other three groups. The implication of this finding is important in that it indicates that the respondents working directly in the schools and school systems do not see the input of parents, community members, or even themselves, as being particularly important to the design process of the facilities in which their children learn. This supports the idea that a school is somehow separate from the rest of the community in which it exists. This is unfortunate on many levels as the backgrounds and viewpoints of stakeholders can only serve to create a more diverse and supportive atmosphere surrounding the process of designing the facility as well as expanding community involvement and support of the school's programs after construction. The importance of stakeholder involvement is well supported by recent studies reported by Brubaker, 1998; Fielding, 1999, August; and The U.S. Department of Education, 1999.

Provide Adequate Health, Safety, and Security - There was a difference between planners and architects and superintendents and the remaining two respondent groups (see Table 4.10), with the planners and architects and superintendents viewing this area as significantly less important than the other groups. The implication that school facility planners and architects as well as superintendents perceive health and security issues as less important than the other respondent groups is somewhat alarming. The physical space is vital to ensuring the continued safety and health of students and staff and should be at the forefront of any school facility design. These issues include planning of traffic patterns on school grounds as well as the supervision and safety of children. Special attention should be paid to air and lighting quality and careful monitoring of possible exposure to toxic building materials. The design of school facilities should incorporate

physical features that enhance safety, such as the correct types of hallways, doors, and monitoring and alarm systems. Traffic patterns, both vehicular and pedestrian, must be carefully considered and designed (Tanner & Lackney, In Press). Architectural features that may add to the potential for violence or crime, such as poorly lit and obscured areas, should be realized and excluded planning phase of any facility. Once the facility is constructed it is often too late to effectively correct or change areas that promote unsafe conditions or health concerns.

The impact of adequate health, safety, and security found in school facilities on school programs and student success is very well supported by a wealth of reported research. Included in this support are studies reported by Castaldi, (1994), Cohen, Evans, Stokols, and Krantz, (1986), Crowe, (1991), Garbarino, (1980), Miller, (1995), Moore & Lackney, (1992), The U.S. Department of Education, (1999), and The U.S. Department of Education & Department of Justice, (1998).

Make Effective Use of All Available Resources - There was a difference between elementary teachers and the remaining three respondent groups (see Table 4.11) with the elementary teachers viewing this area as significantly more important than the other groups. This finding indicates that perhaps facility planners and architects, superintendents, and elementary school administrators needed to expand their scope to facilitate inclusion of the non-physical or built resources during the design phase. The culture and accessibility of the community in which the school is to reside should be carefully considered on a case-to-case basis. As innovative methods of instruction and learning models push students to become active participants who analyze, evaluate, and manipulate information rather than simply passively receive, all school facilities should

be designed to allow the best use all available resources. The planning of these facilities should incorporate technological and physical resources that may be used to further facilitate and support community and business partnerships and interactions. There is also a distinct possibility that increasing demands on all forms of public finances will continue to increase in the United States (The U.S. Department of Education, 1999).

With this in mind it is critical that educational facilities currently being designed and built be developed with projected economic limits in mind and planning should incorporate new and inventive ways to capitalize on and merge with available community resources. This concept is supported in the literature by studies reported by Brett, Moore, & Provenzo, (1993), Lackney, (2003), OECD, (1996), and Stine, (1997).

Selected Tables

Table 4.9

Scheffe' Test [a,b] *for V43- Involve Stakeholders in the Design Process*

		N	Subset for alpha = .05	
	V14		1	2
Planners	1	28	2.61	
Superintendents	4	76		3.79
Administrators	3	43		3.88
Teachers	2	337		4.07
	Sig.		1.000	.828

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 53.266.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 4.10

Scheffe' Test [a,b] *for V44- Provide Adequate Health, Safety and Security*

		N	Subset for alpha = .05	
	V14		1	2
Administrators	3	43	1.81	
Teachers	2	337	2.01	
Superintendents	4	76	2.11	2.11
Planners	1	28		2.75
	Sig.		.717	.086

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 53.266.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 4.11

Scheffe' Test [a,b] *for* V45 - Make Effective Use of All Available Resources

		N	Subset for alpha = .05	
	V14		1	2
Teachers	2	337	3.78	
Superintendents	4	76	4.03	4.03
Administrators	3	43	4.09	4.09
Planners	1	28		4.64
	Sig.		.602	.070

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 53.266.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Thanks for reviewing our truncated results. We plan to submit a condensed version of the complete study for publication in 2005. As soon as the work is accepted for publication, we will link to the source.

C. Kenneth Tanner
January 2005