Chapter 6
A CONCEPTUAL FRAMEWORK
OF EDUCATIONAL ENVIRONMENTS

The previous chapters have described the current state of the art in the research on
school facilities and their impact and role on the educational process. They provide a
substantive backdrop for presenting a comprehensive model of educational
environments. This final chapter focuses on conceptualizing a framework that
integrates the disparate research on the educational environment. First, common
perceptions of the role of the environment in the educational process are made
explicit. Next, precedents in the literature that have attempted to foster this
integration are reviewed and critiqued. From this review, the Multi-dimensional
Model of Educational Environments (MMEE) is formulated. The chapter closes by
discussing the implications of the framework for research and practice.

6.1 THE NEED FOR A COMPREHENSIVE MODEL OF EDUCATIONAL
ENVIRONMENTS

Common perceptions of the physical environment
Part of the problem for advocates for change in the planning, design and management
of school facilities is the manner in which school facilities have been perceived by the
educational community and public-at-large.

Many believe that school buildings constitute no more than passive shells for activity
-- permanent walls which surround what is important -- teaching and learning.
School buildings are rarely perceived as active changing settings which contain
various levels of support for teaching and learning, from the size and configuration of
the room to the placement and arrangement of furniture, equipment, and the various
displays within it; in short, the whole physical setting of the classroom. The very fact
that identically configured classrooms can take on as many variations in internal
arrangement as there are teachers attests to the versatility of the physical setting.

School buildings are often seen independently from the behaviors which take place in
them. The mutually supportive relationship between the physical setting and student,
teacher and administrator behaviors are not recognized. Other than furniture
arrangements, teachers are not trained to be cognizant of the way space can support or
hinder group dynamics, individual privacy, and/or feelings of crowdedness. Even the
territorial boundaries defined by the teacher's desk in relation to students' desks can
have a great effect on students' perception of the position of authority of the teacher
and thus affect teacher/student relations in intangible ways.

Related to the passive/active dialectic, the building is often conceived solely in terms
of a relatively fixed object or product which is not amenable to a great deal of change.
However, the process by which the building is designed, maintained and modified
through formal and informal facility management policies, in addition to daily change
and modification due to teacher adaptations, has not been recognized as an important
factor affecting the effectiveness and efficiency of the educational process.

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The physical environment is typically not perceived as influencing educational outcomes even though most people will admit intuitively that it makes a difference -- what kind of difference the environment might make is unknown. The concept that the impact of the physical environment on educational outcomes is mediated through the interplay of many intervening behavioral and attitudinal factors is not apparent to many, either inside, or outside the educational community. To illustrate, a building that is well-maintained and comfortable will provide a measure of satisfaction that could lead to students doing better on tests. Of course, many other factors would feed into this model, such as teacher ability, differences in student aptitude and so on. The mediational concept, however, would suggest that the physical environment may play some role, in this example, through satisfaction with building conditions.

Criteria for measuring environmental quality
Misconceptions concerning the role and purpose of school facilities originate from the points-of-view taken by various participants in the planning, design and management process. Each participant group brings with them different perceptions of what constitutes a quality environment for education, as well as criteria for measuring it. Each stakeholder group holds different assumptions about the role of the physical setting in the educational process based on that group's established performance criteria for measuring educational quality.

Educational researchers and policymakers faced with establishing measures of accountability across school systems are concerned with measures of academic achievement as the ultimate indicator of educational quality. Based on this performance criteria, researchers and policymakers have discounted the effects of the physical setting based on the limited evidence linking these effects to academic achievement.

School administrators are faced with the dual need to balance budgetary expenditures and academic achievement in an effort to be accountable to school boards, parents, the local community, the business community, and the general public. Educational quality is measured by its cost effectiveness: deriving the highest achievement from the lowest cost. School administrators must act on their own intuitive experience and knowledge of the physical setting gained through operating educational programs in school buildings. They have little empirical evidence upon which to base their arguments to board members and taxpayers for the need to improve physical conditions of their schools. Administrators must wait for upsurges in demographic trends and crowded conditions before a convincing case can be made and deferred maintenance can be addressed.

Teachers' performance criteria for educational quality in the classroom includes improved skill development, behavior and conduct, and drive and motivation to learn. Academic achievement scores, as measured by standardized tests, typically, but not always, reflect these various performance measures. Many teachers, feeling the pressures and dilemmas of accountability, often teach to the test to ensure high test scores. As a result of these more qualitative measures of performance, teachers are the most apt to see the value of the physical setting in achieving their goals. They are immersed in the physical classroom setting on a daily basis and intuitively modify the space to improve the overall learning environment. Unfortunately, due to the lack of emphasis by administrators and facilities managers to acknowledge these more subtle
attributes of the physical setting, teachers must make due with the limited resources they have in order to create an environment conducive to instruction and learning.

Facility managers have a working knowledge of the environmental control systems of buildings and their immediate effects on teachers and students. Facility managers assess the performance of quality in their work to the level of complaints about the physical plant. However, many times facility managers do not see other aspects of facility management which are just as important as operating and maintaining building systems, such as the importance of the timely response to occupant complaints, the symbolic value of learning in a quality environment and the potential contributions of environmental quality on the overall quality of the educational process.

Design and planning professionals equate 'good design' with quality in the educational environment. Performance criteria conventionally set for obtaining good design include functional and aesthetic design which meets the organizational goals of the school (i.e., scope, educational program, budget, and schedule). Planning and design professionals who have offered the most in terms of creative design solutions and implementation of school facilities planning do so without an adequate understanding of the educational process beyond the level of meeting formal organizational goals and objectives.

The public, broadly defined (society, business, community), is most concerned with the quality of education as a cost effectiveness measure: highest achievement at the lowest cost to the taxpayer. Education which increases in cost is assumed to be wasteful, especially if achievement does not appear to be competitive with other developed countries. Businesses are especially concerned about the cost effectiveness of the educational system as the "products" of the system constitute the future workforce. In this attempt for cost effectiveness, the physical environment is almost completely ignored with the possible exception of computers in the classroom.

A comprehensive model which integrates these conflicting perceptions and criteria would be practical not only for educational researchers, but also for educational policymakers, school administrators, teachers and staff, design and planning professionals, and the various participants in the local community. A model of the educational environment that clarifies individual and group goals and objectives might provide a vehicle for making explicit each stakeholder's interests and offer alternative directions and solutions that might resolve conflicts.

The following section reviews and critiques some of the approaches in the literature that offer such integrative views of the total educational environment.

6.2 A SURVEY OF ECOLOGICAL MODELS IN THE LITERATURE

Research on educational environments has typically followed a pattern of investigation which has limited the ability of researchers to compose a comprehensive picture of what constitutes a supportive environment for learning. For instance, the educational literature emphasizes organizational and social aspects of the learning environment without mentioning the possible role the physical setting provides in learning. The architectural literature emphasizes physical setting solutions formulated on misconceptions of educational philosophies, as in the case of open classrooms of
the 1960’s. Finally, environmental psychology literature focuses primarily on the psychological responses to specific environmental features researched in isolation to other physical setting factors, and often at the expense of social and organizational variables. In most cases, environmental psychology research focuses on the uni-directional impact of specific physical features of the environment upon student classroom behavior, achievement, and attitudes.

There have been a number of models proposed in the educational, psychological and architectural literatures over the past 20 years which attempt to characterize the many dimensions of the school environment. Three models have been identified from the educational literature: Hoy & Miskel’s social systems model for schools (1991); Anderson’s interactive model of environmental dimensions and their interactions with school climate (1982); and Centra & Potter’s structural model of school and teacher variables influencing student learning outcomes (1980). From the literature in environmental psychology, three models have been identified: the ecological model of school environments of Barker and Gump (Barker & Gump, 1964; Gump, 1987); Moos’ school environment assessment model (1979); and Bronfenbrenner’s hierarchy of ecological systems model (1977). Finally, from the architectural literature, two models have been identified which have implications for modeling school environments: Markus’ conceptual model of the system of building and people (1972); and Weisman’s environment-behavior systems model (1981).

The models identified above represent attempts that come closest to establishing a ecological or holistic view of educational environments (See Table 6.1 Ecological Models of the Educational Environment).

Although the studies identified exhibit ecological research agendas, there is still a clear bias towards a specific component in the human-environment ecology most closely aligned with the particular field of inquiry: Hoy & Miskel (1991) emphasize social behavior in schools; Anderson (1982) emphasizes organizational and psychosocial climate of school settings; Centra & Potter (1980) focuses on student learning outcomes; Gump (1987) emphasizes the behavior setting and individual behavioral responses as the centerpiece of his ecological perspective; Weisman (1981) emphasizes the primacy of environmental experience; while Markus (1972) emphasizes aspects of the physical environment over individuals and groups. Each model, however, while emphasizing particular dimensions of the human-environment ecological system, offers insight into different aspects and ways of viewing the system which must be taken into account.

In the following eight sections, each model is briefly described and critiqued in terms of its conceptualization of the educational environment and its contribution to a comprehensive conceptual framework. The following questions were posed to the eight models:

(1) How does the model conceptualize the educational environment?

(2) What is the intent of the model?

(3) To what extent does the model represent a whole-systems perspective?
### Table 6.1 Ecological Models of the Educational Environment

<table>
<thead>
<tr>
<th>Source</th>
<th>Name</th>
<th>Type of Model and Components</th>
<th>Outcomes</th>
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| Hoy & Miskel (1991)     | Social systems model for schools          | Interational  
School as a social system consisting of congruence relationships between Institution (Bureaucratic Expectations), Work Group (Informal Norms) and Individual (Work Motives).                             | Social behavior                               |
| Anderson (1982)         | Interactive model of environmental       | Ecological  
Environmental dimensions of school climate: Milieu, Culture, Ecology, Social System                                                                                                                                     | School climate                               |
|                         | dimensions and their interactions w/ school climate |                                                                                                                                                                                                                                 |
| Centra & Potter (1980)  | Structural model of school and teacher    | Structural/Interational  
School or school district conditions; teacher characteristics; within school conditions; student characteristics; teaching performance; student behavior                                                                 | Student learning outcomes: basic skills, other cognitive outcomes; non-cognitive measures |
|                         | variables influencing student learning outcomes |                                                                                                                                                                                                                                 |
| Gump (1987)             | Ecological behavior -setting model of    | Ecological  
An ecological behavior setting consists of action structures (or programs) and the physical milieu. The physical milieu consists of milieu regions, positions and manipulanda | Behavior settings                             |
|                         | school environments                      |                                                                                                                                                                                                                                 |
| Moos (1979)             | Model of the relationship between        | Ecological  
A social-ecological conceptual framework to evaluate educational settings consisting of the following domains: environmental system, personal system and mediating processes (cognitive appraisal, activation and arousal, and efforts at adaptation and coping) which effect student stability and change | School climate                               |
|                         | environmental and personal variables and student stability and change |                                                                                                                                                                                                                                 |
| Markus (1972)           | Conceptual model of the system of building and people | Structural/Interational  
Subsystems: Building, Environmental, Activity, Objectives, Resources systems.                                                                                                                                                      | An open, dynamic system which maintains stable adaptation |
| Weisman (1981)          | Environment-behavior systems model        | Organismic  
Individual's goals and needs; Organization's long-range objectives and policies; and the Physical environment (properties and components).                                                                                                                                 | Environment-as-experienced  
(attributes: comfort, crowdedness, privacy, control, legibility & meaning, etc.) |
| Bronfenbrenner (1977)   | Hierarchy of ecological systems model    | Ecological  
A nested hierarchy of setting structures which combine to create an ecological environment: the microsystem, mesosystem, exosystem, macrosystem                                                                                   | System stability and change                   |
6.1.1 Hoy and Miskel's Model of Social Systems for Schools

1. How does the model conceptualize the educational environment?
Hoy & Miskel (1991) is an adaptation of the Getzels-Guba systems model of social behavior and the administrative process first proposed in 1957\(^8\). Hoy and Miskel's model of social systems for schools (1991; 36-43) places emphasis on the school as a social system consisting of congruence relationships between the Institution (Bureaucratic Expectations), the Work Group (Informal Norms) and the Individual (Work Motives). The model illustrates the continuous tension which exists between bureaucratic, informal and individual elements in the organization. This social system, internal to the organizational system of the school, receives Inputs (Resources, Values, Technology, History, Community, State and National Demands, and the Board of Education), and provides Behavioral Outcomes (Adaptation, Goal Achievement, Integration and Latency) (see Figure 6.1). Finally, Behavioral Outcomes provide the drive for both internal and external feedback to the organizational system of the school.

2. What is the intent of the model?
Formal organizations are organizations established to achieve certain goals. They are often at odds with both individual member needs and values and the emergent patterns of social life of informal work groups (such as their informal practices, values, norms and social relations). In addition, external forces put strains on the formal organization as well. In order for a formal organization to survive, it must accomplish the goals it has set out to achieve. The model attempts to focus on these various determinants of behavior within formal organizations in order to further the research and practice of educational administration. The social systems model is intended to draw attention to several key organizational concepts useful to the theory and practice of educational administration (Hoy & Miskel, 1991; 43-53): effectiveness, efficiency and satisfaction; morale; leadership style; bureaucratic socialization; conflict; organizational effectiveness; and organizational problem analysis in schools.

3. To what extent does the model represent an ecological perspective?
Hoy & Miskel's Social Systems Model for Schools offers a highly integrated model of the school environment. Individual, group and organizational aspects of educational environments are carefully considered and are given equal weight. A full range of social and behavioral complexities are dealt with in the model. The model represents years of integration of the literature on educational administration.

The model emphasizes the primacy of organizational outcomes over individual and group outcomes. Goal achievement, adaptation and integration of the formal organization are seen as the ultimate behavioral outcomes of the system. It is hypothesized that organizational goals are generated through the resolution of congruent relationships between the institution, informal work groups and individuals. The authors postulate, for instance, that "the greater the degree of congruence among the elements of the system, the more effective the system" (Hoy & Miskel, 1991; 41). Effectiveness is defined as a congruence between individual motivations, informal group norms and formal expectations. The closer the first two

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elements come to be congruent with formal expectations the more effective the organization will be in reaching its formal goals. Nevertheless, the model clearly emphasizes goals and outcomes which maintain the formal organization over individual and work group goals. The impact and role of the physical setting of the school on the goals of the organization is absent from this model.

Figure 6.1 Hoy and Miskel's model of social systems for schools (Adopted from Hoy & Miskel, 1991)
6.1.2 Anderson's Model of Environmental Dimensions and School Climate

1. How does the model conceptualize the educational environment?
Anderson's interactive model of environmental dimensions and their interactions with school climate (1982) is a synthesis of the research literature on school climate compiling over 200 references on the subject (see Figure 6.2). School climate is a construct which accounts for all factors which influence the "total environmental quality" of a school setting. The difficulty in defining school climate, a stepchild of organizational climate, is that it has evolved into a diversity of typologies, theoretical bases, variables to study, units of measurement choices and questions the validity of subjective and qualitative data. Anderson has developed a typology which emerges from a review of the literature on school climate; being defined by four interrelated dimensions:

(1) **Ecology**: physical and material aspects such as building characteristics (age, condition, size of school);

(2) **Milieu**: teacher characteristics and morale, student body characteristics and moral.

(3) **Social system**: administrative organization, instructional program, ability grouping, administrator-teacher rapport, teacher shared decisionmaking, good communication, teacher-student relationships, student shared decisionmaking, opportunity for student participation, teacher-teacher relationships, community-school relationships, involvement instruction; and

(4) **Culture**: teacher commitment, peer norms, cooperative emphasis, expectations, emphasis on academics, rewards and praise, consistency, consensus and clear goals.

2. What is the intent of the model?
From the widest perspective, it is believed that understanding the influences on school climate will improve the understanding and prediction of student behavior. The model is intended to first provide some basis for comparison within the school climate literature. The article suggests that policymakers are interested in identifying mechanisms which can be easily manipulated to affect student outcomes such as achievement. It is not clear that the construct of school climate is specific enough to accomplish such policy objectives. In addition, researchers do not agree on either the possibility or desirability of identifying school climate.

3. To what extent does the model represent an ecological perspective?
School climate, as a construct, is more holistic than simple elementalism (that is, discrete entities or elements that interact). School climate research attempts to take into consideration school processes (social organization) as well as static variables. Historically, school climate research has emphasized the concentration on the relationships between component elements, rather than on a conceptualization of the total organization. This model attempts to rectify this situation by providing a more holistic perspective of the mechanisms behind elemental relationships.
Figure 6.2 Anderson's interactive model of environmental dimensions and their interactions with school climate (Adopted from Anderson, 1982; 405)
6.1.3 Moos' Model of the Relationship Between Environmental and Personal Variables and Student Stability and Change

1. How does the model conceptualize the educational environment?
In his book *Evaluating Educational Environments* (Moos, 1979; 1-21), Moos presents what he calls a social-ecological conceptual framework to evaluate educational settings, and develops scales that measure the social environments of school settings. The conceptual framework focuses on the importance of four domains of environmental variables on stability and change in student behavior and attitudes.

The model in Figure 6.3 recognizes the existence of the environmental and personal systems which influence each other through what he calls selection factors (people selecting environments and other members) and mediating processes (cognitive appraisal, activation and arousal, and efforts at adaptation and coping).

The environmental system is categorized into four major domains: (1) **physical setting** (e.g., architecture, physical design layouts and arrangements), (2) **organizational factors** (e.g., size, faculty-student ratio, average salary level, affluence), (3) **the human aggregate** (e.g., age, ability level, socioeconomic background, educational attainment as situational variables), and (4) **social climate**. Moos focuses on the extent to which social climate is determined by and mediates the influence of the other three domains.

The personal system is categorized into individual background characteristics such as age, sex, ability level, interests and values, ego strength and self-esteem, preferences for certain coping styles, attitudes and expectations.

Mediating processes (cognitive appraisal, activation and arousal, and efforts at adaptation and coping) have the potential to change aspects of both personal and environmental systems. For example, a student who joins an organization may change his or her attitudes (a change in the personal system) while at the same time creating a new social group within the organization (a change in the environmental system); this event would be an example of the step called "efforts at adaptation and coping." Efforts at adaptation lead to index outcomes such as personal values and interests, aspiration levels, mood, self-concept and health, resulting in either stability or change in student behavior. This change can lead to the possibility of changing the environmental and personal systems, to either regain stability or affect change, depending on the circumstances.

2. What is the intent of the model?
Moos' primary concern for developing this model is to focus on social climate in a variety of settings. This model particularizes his work on the evaluation of the social climate of educational environments. The social environment of the school has been measured using the Learning Environment Inventory (Anderson & Walberg, 1974) and the Individualized Classroom Environment Questionnaire (Rentoul & Fraser, 1977), across three domains: relationship, personal growth, and system maintenance and change.

3. To what extent does the model represent an ecological perspective?
Moos indicates that many investigators focus on impact and evaluate only those variables of educational settings they believe to be related to the outcome they aim to explain. This approach often leads to the omission of factors that may affect outcome and trivialize the understanding of the environment and the processes by which it
functions. Moos advocates that the educational setting must first be adequately conceptualized before its impact on students' attitudes and behavior can be evaluated (Moos, 1979; 20-21). The model developed by Moos emphasizes his concern with environmental assessment as an intermediate step towards staff and program evaluation, and on-going efforts to change and improve students' learning settings.

![Diagram of Moos' Model](image)

Figure 6.3 Moos' Model of the Relationship Between Environmental and Personal Variables and Student Stability and Change
(Adapted from Moos, 1979; 5)
6.1.4 Barker & Gump's Ecological Theory of Behavior Settings

1. How does the model conceptualize the educational environment?
Barker & Gump (1964), and Gump (1978, 1987) have developed an ecological theory of behavior settings which has provided them with a unique conceptual framework and research agenda for school and classroom environments for the past thirty years. The objective of Barker and Gump has been to describe educational environments from an ecological perspective.

An ecological behavior setting is defined as an entity which consists of a mutually defining relationship between an action structure (or program) and a physical milieu (spatial configuration or arrangement). It is theorized that these two components of the behavior setting will tend toward synomorphy, or "similarity of shape" (Barker, 1968). For example, participants in a reading circle accept a certain action structure in order to carry out the day's lesson; the physical arrangement of chairs in the reading circle (physical milieu) has an interlocking relationship with the action of reading in turn with discussion between taking turns reading (action structure or program) (Gump, 1987; 692).

Schools and classrooms within schools can be considered clusters of behavior settings. Gump distinguishes between three main environments in the school setting: physical milieu (milieu regions, positions and manipulanda), action structures (programs) and psychological (individual affective and cognitive states); the first two comprising behavior settings.

2. What is the intent of the model?
From Gump's point of view research on school environments is not approached from an ecological perspective: the physical environment of the school is investigated independent from the program, resulting in studies which do not give equal attention to the impact of the program on student achievement. The reverse can be said to be true in the educational research literature.

The intent of the behavior setting theory is to explicitly recognize the interrelated and inseparable nature of physical environments and the action structures they are designed to accommodate. Gump feels that our difficulties in the development of useful research findings is related to the fragmentary nature of the "pre-yield," in contrast to identifying relevant contextual units, or viewing instruction as a process of establishing and maintaining classroom activities. Gump suggests that establishing these contextual units is necessary to keep from "drifting" into the phenomena of individual psychology. He feels that teachers and administrators already think and act in terms of larger units such as activities, classes, meetings, assemblies. What is needed, then, is research which addresses the concerns of teachers and administrators (Gump 1987; 726). Within this conceptualization, it is theoretically possible to manipulate either one of these environments, affecting the other by implication, thereby impacting the psychological environment of individual students in some positive direction.

3. To what extent does the model represent an ecological perspective?
The model does not consider the organizational rules and regulations which comprise school structure beyond the behavior setting. It can be argued that behavior settings are impacted by external factors such as organizational goals, expectations, rules and sanctions, as well as the presence of other competing behavior settings. The model
rules out any investigation of individual student attitudes (the psychological environment), investigating instead only individual behavior without regard for motivation. In addition, individual differences cannot be tracked either utilizing this model.
6.1.5 Centra & Potter’s Structural Model of Variables Influencing Learning Outcomes

1. How does the model conceptualize the educational environment?
Centra & Potter’s model (1980) emphasizes groups of variables which combine to influence specific student learning outcomes (see Figure 6.4). The model identifies causal as well as correlational relationships between these variables. Teacher characteristics are influenced by school or school district conditions (school size, resources, ratios, services, facilities, class size, location of school, social class, race) and internal school conditions (administrative and instructional organization, peer group influences, class size environment or ambiance and quantity of schooling). These influences affect teacher performance, student behavior and student learning outcomes. Student characteristics are seen as influencing teacher performance, student behavior and learning outcomes.

2. What is the intent of the model?
Centra and Potter felt that given the numerous methodological problems associated with acknowledging all possible factors associated with student learning, no single study ever has, nor ever will, adequately investigate the influence of all these factors. Nevertheless, the authors present a structural model of the factors they believe affect student learning, primarily for its heuristic value in conducting structural analysis techniques (e.g. path analysis).

3. To what extent does the model represent an ecological perspective?
The model represents the structural relationships established through the review of school productivity research and school effects studies. In this sense, the model represents an attempt to synthesize the state of empirical research conducted on the factors which effect student achievement as the final outcome. The model, while taking into consideration the many aspects of the educational environment, focuses primarily on one particular outcome without allowing for opportunities for research on the other aspects of the educational environment that do not directly impact student achievement.
Figure 6.4 Centra & Potter's structural model of school and teacher variables influencing student learning outcomes
(Adopted from Centra & Potter, 1980)
6.1.6 Markus' Conceptual Model of the System of Building and People

1. How does the model conceptualize the educational environment?
The conceptual model of the system of building and people (Figure 6.5) includes the building system (hardware such as construction, services and contents), the environmental system (spatial and physical), the activity system (identification, control, communication, informal activity, and workflow), the objectives system (production, adaptability, morale, stability) and the resources system (cost of provision, cost of maintenance, cost of activity, and the value of achieving a particular objective). This model can be extended into time (Figure 6.6) from conception to building demolition to form a dynamic homeostatic model of environmental change.

2. What is the intent of the model?
The objective of the research conducted by the Building Performance Research Unit (BPRU), and supported by the RIBA, was to develop a set of appraisal techniques to evaluate completed buildings. School buildings were chosen as the sample of buildings to be appraised by the BPRU using this conceptual model.

3. To what extent does the model represent an ecological perspective?
Markus' conceptual model of the system of building and people is the only model of the school organization thus far which takes into account changes in the school environment over time (see Figure 6.6). The model has the potential of integrating all aspects of decisionmaking in the organization, from administrative to educational to facilities management, by incorporating two activity sub-systems: design (control) and production. Design is part of most human activity patterns: it can be conceived as a generative sub-system of a larger system and is present and continuous from the inception to demolition of the building.
Figure 6.5 Markus' conceptual model of the system of building and people
(Markus, 1972)

Figure 6.6 The system model extended in time
(Markus, 1972)
6.1.7 Weisman's Environment-Behavior Systems Model

1. How does the model conceptualize the educational environment?
The environment-behavior systems model was conceptualized to generalize
organizational/institutional type settings (Weisman, 1981). The outcomes of the
environment-behavior systems model (EBS model) emphasize the characteristics of
the “environment-as-experienced,” represented by environmental attributes such as
sensory stimulation, comfort, activity, crowedness, privacy, legibility, meaning
among others (Figure 6.7). The model identifies three factors, or subsystems, which
influence this environment-as-experienced: individuals, organizations and the
physical setting. Each of these components of the environment-behavior system can
be seen as comprising two levels or scales. The individual component is comprised of
patterns of behavior which are directed by goals or needs. The organization embodies
long-term objectives which serve to shape everyday policies and rules. Finally, the
physical environment is comprised of physical building components (such as walls,
windows, light fixtures, HVAC equipment, and tables and chairs) each of which has
corresponding sensory and spatial properties (such as size or shape of rooms, views,
illumination, temperature, and workspaces) which are in turn experienced by the
individuals of that setting. The environment-behavior systems model emphasizes the
complex ecological nature of the setting, in which the environment is influenced at all
times by interactions between the organization, individuals and the physical
environment.

2. What is the intent of the model?
The environment-behavior systems model was originally developed by Weisman in
an effort to embrace two theoretically different approaches: one emphasizing the
objective, interactional aspects of the environment and the other emphasizing the
subjective or phenomenal aspects of the environment (that is, “environment-as-
experienced”). The model provides a synthesis between these two approaches to
conceptualizing the environment allowing analysis of environments across both
objective and subjective domains.

3. To what extent does the model represent an ecological perspective?
The model is successful in cogently categorizing an educational setting from the
points of view of many different constituencies simultaneously. It is flexible enough
to deal with all aspects of the environment-behavior system. The environment-
behavior systems model does not, however, explicitly deal with the social
environment created by group goals and activities, often at odds with both individuals
and the organization. In addition, the model does not explicitly identify external
social, cultural, economic and political factors continuously impinging on the
organization and its members.
Figure 6.7 Weisman's Environment-Behavior Systems Model
(Adopted from Weisman, 1981)
6.1.8 Bronfenbrenner's Hierarchy of Ecological Systems Model

1. How does the model conceptualize the educational environment?
In an attempt to clarify the levels or scales of influence which are an inherent part of ecological systems, Bronfenbrenner developed a nested hierarchy of setting structures which combine to create an ecological environment: the microsystem, mesosystem, exosystem and the macrosystem. The microsystem is the "complex of relations between the developing person and the environment in an immediate setting containing that person...a setting is defined as a place with particular physical features in which the participants engage in particular activities in particular roles for particular periods of time (Bronfenbrenner, 1977; 514). These six components of a setting -- place, physical features, participants, activities, roles, and time -- defined the variety of influences that ecological research in a microsystem should take into account.

A mesosystem "comprises the interrelations among major settings containing the developing persona at a particular point in his or her life" (Bronfenbrenner, 1977; 515). The mesosystem, then, is a constellation of all microsystems, or settings, an individual is currently experiencing. An exosystem "is an extension of the mesosystem embracing other specific social structures, both formal and informal, that do not themselves contain the developing person, but impinge upon or encompass the immediate settings in which that person is found, and thereby influence, delimit, or even determine what goes on there" (Bronfenbrenner, 1977; 515). This level goes beyond identifiable "settings" to include other forces which shape the lives of individuals in a society such as mass media, government, and the distribution of goods and services. Finally, the macrosystem "refers to the overarching institutional patterns of a culture, or subculture, such as the economic, social, educational, legal, and political systems, of which the micro-, meso-, and exo-systems are the concrete manifestations. Macrosystems are conceived and examined not only in structural terms but as carriers of information and ideology that, both explicitly and implicitly, endow meaning and motivation to particular agencies, social networks, roles, activities and their interrelations" (Bronfenbrenner, 1977; 515). In other words, the macrosystem is a set of general patterns by which a culture establishes itself.

2. What is the intent of the model?
Weisman's EBS model is one of the few models which attempts to differentiate several levels of operation of particular dimensions. Extending and expanding this idea of levels or hierarchies, Bronfenbrenner (1977) offers a model of the human environment which explicitly articulates levels of dimensional operation not often addressed in the literature.

3. To what extent does the model represent an ecological perspective?
The value of Bronfenbrenner's model is that, like the EBS model of Weisman, each dimension of the model exists at all levels of the hierarchy simultaneously. As a result, all aspects of the environment can be examined at each of the four levels of the setting. Unfortunately, Bronfenbrenner does not carry out the implications of his six components of the setting (place, physical features, participants, activities, roles and time) mentioned in the microsystem at the other three levels of his model. It is possible that these components continue to manifest themselves at the higher levels of the ecological system.
6.3 A COMPREHENSIVE MODEL OF EDUCATIONAL ENVIRONMENTS

The majority of empirical research on educational environments does not build on a comprehensive understanding of the school environment as an ecological system of interrelated dimensions. Admittedly, evaluating the educational environment as a totality may be an impossible task. However attempting to deal with the complexity of these dimensions at some level is critical if a more effective approach to solving the problems associated with providing supportive learning environments for children is to be realized.

The Multidimensional Model of Educational Environments (MMEE) developed here incorporates the above insights from the educational, environmental psychology and architectural literature by synthesizing them into a more comprehensive framework that can be seen to characterize all organizations. The MMEE emphasizes the ecological nature of dynamic relationships between five distinct dimensions of the total environment of the school: personal, social, organizational, physical and temporal. Each of these components or dimensions are conceptualized as existing at five hierarchical levels: context, goals, actions and two levels of outcomes (See Figure 6.8).

Aspects of each cell in the model (Dimension x Level) can be fully known, implicitly known or even hidden by any one individual or group of individuals. In other words, aspects within each cell are either explicit or tacit to individuals participating in a certain activity or function depending on the circumstances of their involvement. In this sense, the model follows the intent of Weisman's environment-behavior system model (1981) in attempting to represent both objective and subjective aspects of the human-environment system.

Dimensions of the Model
The Multidimensional Model of Educational Environments emphasizes the ecological nature of the relationship between four distinct dimensions of an environmental system: the personal, the social, the organizational, physical, temporal (see Figure 6.8). These dimensions follow Weisman's environment-behavior system model with the addition of explicit social and temporal dimensions. Following Barker and Gump's behavioral setting theory, while each dimension of the setting or educational environment can be described, defined and operationalized independently, to understand the any one dimension requires an examination of each dimension in relation to other dimensions. The implications of this complex of relations between dimensions suggests that behavior is more than just a sum of the dimensions of person and environment, but that behavior is a consequence of the unique interaction between person and environment above and beyond their separate influences.

Hierarchical Levels of the Model
Each of these components or dimensions exist along five hierarchical levels: context, goals, actions, and two levels of outcomes. This aspect of the model was inspired by Bronfenbrenner's hierarchy of ecological systems model with the actions level representing Bronfenbrenner's micro- and mesosystems.

Contextual Level
The context refers to extra-organizational, societal, and cultural influences on all dimensions in the model. Individuals and social groups (personal and social dimensions) are influenced by cultural norms and expectations which are part of
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Personal</th>
<th>Social</th>
<th>Organizational</th>
<th>Physical</th>
<th>Temporal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>Cultural norms &amp; expectations of individual participants</td>
<td>Cultural norms &amp; expectations of various groups</td>
<td>Extra-organizational influences (boards, citizens, society)</td>
<td>Building Industry</td>
<td>Historic Events</td>
</tr>
<tr>
<td>Context</td>
<td>Long-range &amp; immediate goals of individual participants</td>
<td>Long-range &amp; immediate goals of various groups</td>
<td>Long-range &amp; immediate goals of the school</td>
<td>Design intent in relation to educational program</td>
<td>Strategic planning processes</td>
</tr>
<tr>
<td>Goals</td>
<td>Behavioral, affective &amp; cognitive states of individual participants</td>
<td>Group interaction and activities</td>
<td>Curriculum &amp; other organizational policies</td>
<td>Physical design systems &amp; components</td>
<td>Scheduling &amp; Events</td>
</tr>
<tr>
<td>Actions</td>
<td>Student learning outcomes</td>
<td>Effectiveness of communication &amp; cooperation in achieving goals</td>
<td>Effectiveness &amp; efficiency in reaching educational goals</td>
<td>Attributes of place</td>
<td>Events in present moment</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Environmental Quality School Climate Quality of Education</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Figure 6.8 Multidimensional Model of Educational Environments
general society and not under the control of an organization. For example, in American society, individuality, autonomy, and self-reliance are generally accepted as ideal, acceptable and desirable traits. These traits have an influence on what will and will not take place within a particular organizational setting. Working in groups, for instance, might be an undesirable activity for many individuals accustomed to the accolades rewarded to individual achievement, thus putting a strain on aspects of organizational effectiveness. Within the realm of organizational dimension, the context takes the form of extra-organizational influences that include such bodies as local school boards, local, state and federal government laws, regulations, and statutes, parent groups, citizen taxpayer groups, corporate sponsorships, and the general level of social and economic vitality of the local community. The dimension of the physical environment also manifests itself at the level of context in the form of the building industry which includes current facility development practices and procurement strategies, as well as prevalent architectural styles of an area or region, and availability of building technologies, structural systems and building materials. Finally, the temporal aspects of the environment are manifested as historical events that form collective memories, both positive and negative, about a particular school setting.

**Goals Level**

The *goals level* of the educational environment within the personal and social dimensions include long-range goals, objectives and agenda which influence directly how an individual or group acts in the setting. Within the organizational environment, the goals includes such aspects as mission statements, long-range strategic goals, curriculum planning and decision-making. Following the implications of Markus' conceptual model of the system of building and people (1972), the facility design, planning and management function is embedded in the organizational environment at this level. At the intersection of the goals level and the physical environment dimension, the intent of the building design is expressed as it relates to the educational program. Goals are manifested through temporal dimensions of the environment as well, including such processes as strategic and operational planning.

**Actions Level**

The *actions level* of the educational environment within the dimensions of personal and social environments include the immediate wants and abilities of students, teachers, administrators, support staff and parents. The organizational dimension includes such aspects as rules and policies, administrative decisionmaking, and expectations, rewards and sanctions of the organization, as well as curriculum and instruction strategies. Management, a sub-component of the organizational dimension at this level illustrates the place for facility management in the on-going management and operations of the system. The physical environment dimension manifests physical components and properties at this level of the system such as structure and enclosure systems, environmental control systems, classroom size and shape, school size, levels of illumination, sound absorption, flexibility, etc. Finally, the temporal aspects are ubiquitous at the level of actions. It is at this level of the system that dynamic relationships between the five dimensions of the system become increasingly overlapping and mutually defining. Dynamic interaction between dimensions are often manifested in the form of conflict. For instance, an individual student's abilities may not match the wants and abilities required by a particular student study group, or the goals of an informal teacher group may be at odds with some established organizational policy. Adjustments must be made by either or both dimensions in order to insure the smooth operation and continuance of the system.
How these conflicts and interactions between dimensions of the system are resolved will influence the outcomes of the system.

**Outcomes Level**
The model also suggests there exist two distinct theoretical levels of outcomes. The dimensions of the system at the most immediate level of the educational environment are linked directly to the first level of these outcomes: first-order outcomes. First-order outcomes can be analyzed according to any or all of the five dimensions or units of analysis. Outcomes at the personal dimension include individual behaviors, attitudes and cognitive states of students, teachers and administrators. At the dimension of the social environment, outcomes include group interaction and activity. At the organizational dimension outcomes include aspects of effectiveness and efficiency, such as in reaching established educational goals. The physical and temporal dimensions can be investigated at the level of first-order outcomes in relation to the personal, social and organizational dimensions. Attributes of the physical environment such as privacy, crowdedness, control and legibility can be evaluated in relation to personal, social and organizational use of space. Finally, temporal dimension issues such as scheduling and event timing can be reviewed in relation to individual, group and organizational actions.

These various outcomes combine to influence what can be identified as second-order, or ecological outcomes and include such constructs as environmental quality, quality of education, quality of life, meaning, congruence, and sense of place. Within the context of educational environments, school climate is a unified system outcome constituting a holistic construct comprising aspects of all five dimensional outcomes. A characteristic of ecological outcomes is that they have continually proven difficult to assess (see Anderson, 1982 for a description of the problems connected with assessing school climate). Unified system outcomes can be conceptualized as feeding forward back into the contextual level of the educational environment. For example, changes in the "quality of education", such as evidence of decreased student performance with respect to other industrialized countries, may adversely affect social and cultural attitudes towards the educational system inciting yet another round of educational reform from outside the system. Educational reform measures may, in turn, have an impact on the goals, and subsequent actions of the educational system.

At the first level, outcomes are interactional in nature, while at the second level outcomes are ecological in nature. At the first level, outcomes are particular to a specific dimension of the school environment, while at the second level, outcomes are considered more integrated and holistic in nature. First order outcomes are more readily measurable, while second-order, ecological outcomes are more ambiguous and difficult to measure.

### 6.4 CONCLUSIONS: IMPLICATIONS OF THE MODEL

The multidimensional model of educational environments shows promise of capturing the full range of realities which comprise the school environment. In addition, the model can be utilized by both educational researchers and practitioners.

**Implications for research**
Theoretically, the model is able to integrate multidisciplinary research across several domains: environmental psychology, sociology, architecture, educational
administration and educational psychology. The model also provides an opportunity for the application of knowledge on the educational environment by placing it in a broader context.

The model challenges the current status of empirical knowledge on the educational setting. Substantively, work on the relationship between the physical environment of the school and educational programs has focused primarily on personal characteristics and outcomes such as student behavior, attitudes and achievement. For instance, student achievement has been found to be directly affected by class and school size. Physical setting characteristics such as seating position, windowless classrooms, thermal and acoustic conditions, classroom configuration and design, open and conventional classrooms, have all been found to affect student and teacher attitudes and behavior without significantly affecting achievement scores. The combined effect of the physical environment on achievement is not definitively known. In addition, the mediational effects of these variables on achievement has not been investigated. This model provides the platform for the investigation of these issues.

How, for instance, do teacher attitudes about the physical classroom conditions affect student achievement? Do students' attitudes and behavior as a partial result of environmental conditions (hot, cold, noisy) affect their performance on tests? If so, do student attitudes towards the physical setting influence their ability to perform on tests? To what degree are teacher attitudes a function of simple classroom layout (e.g., frustration at not being able to see students around corners, not having enough storage space, etc.)? To what degree is the inability of a teacher to execute a particular instructional design (e.g., small group instruction in an open plan) based on a particular educational philosophy being implemented at the school? These are the kinds of questions which arise when a researcher looks more ecologically at the educational setting within which students try to learn and teachers attempt to instruct.

Other substantive issues which have not been addressed by the literature include the special problems of urban schools, the role and impact of facility management policy and its effects on the environmental quality of the school, and, as stated earlier, an investigation of the interactional effects of the physical setting on learning through the behavior and attitudes of teachers, students and administrators.

Reframing the situation of the school environment in terms of its ecological setting suggests that the dynamic balance between the four dimensions of the educational environment will bring about better test scores, attitudes and social behavior. If groups and individuals work in concert with organizational goals, and the physical environment is designed and managed in accordance with those goals, yet flexible enough to respond to changes in the educational setting, outcomes at all levels of the educational environment will improve.

**Implications for practice**

The Multidimensional Model of Educational Environments could be useful not only as a research tool for educational researchers, but also as a practical assessment device for educational policy makers, school administrators, and planners of educational facilities who continuously grapple with the complexities of the school environment on a daily basis.

A school, practically speaking, is complex and multifaceted, but it nevertheless constitutes a singular entity with certain characteristics and goals. These goals -- the
educational mission -- must be addressed within a framework of competing realities, constituencies and motivations. In order for educational administrators to make the kinds of decisions that are required, they must understand the educational environment in its totality: how the organization is structured, formally and informally; the needs of the community as they relate to the goals of the school; the instructional and curricular goals of the teaching staff; the daily activities within the physical setting itself; and the needs of the children being served. This type of systemic understanding crosses all disciplinary boundaries and requires that an administrator cope with many different levels of concern simultaneously. Similarly complex decisions are made by teachers and academic staff daily. The model respects the multidimensional aspects of the school by providing a platform from which to evaluate diverse knowledge on educational environments.

Practice-based research
Researchers of the educational environment have much to learn from the knowledge and experience gained through educational practice. The creation of a theoretical framework for understanding educational environments has been born out of necessity: educational planners, architectural designers, and facility managers have, for too long, operated without full knowledge regarding the creation of an ecological educational environment which meets the needs of all constituencies simultaneously. Practitioners, by their very nature, must make decisions based on past experience and on their ability to predict future possibilities. Utilizing a comprehensive framework, researchers could learn more about the outcomes of these kinds of practical experiments practitioners conduct everyday and codify this valuable knowledge and experience through empirical research.

The success of the model in integrating a vast amount of knowledge on the educational environment is dependent on the its ability to clearly communicate that which are very complex sets of interrelationships. The model must ultimately confront the abilities of researchers and practitioners to deal with philosophical issues raised by the model. Can practitioners and researchers see the implications of these complex relationships between multiple dimensions, or will the conventional view of buildings as containers of activity continue to prevail? Does the basic model of education consider all possibilities? Is the model consistent with the conclusions drawn here? Does the current mode of architectural practice recognize educational needs? These are the types of questions that will need to be answered in the process of forming a common vision of educational environments. Adopting the long-range view and creating a comprehensive inclusionary image of educational environments is the only path to creating helpful, dependable, emotionally satisfying and equitably viable places for teaching and learning.

REFERENCES


