

# EVIDENCE-BASED DESIGN

## of Elementary and Secondary Schools

A Responsive Approach  
to Creating Learning Environments



**PETER C. LIPPMAN**



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of Elementary and Secondary Schools



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**PETER C. LIPPMAN**



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# Preface

Although *Evidence-Based Design of Elementary and Secondary Schools* examines the design of learning environments, it is not about design. This book is the first of its kind; it has been written for the design professional, the educator, and the researcher interested in understanding how learning environments can be programmed, planned, and designed. The vision for this book was to increase:

- Design professionals' awareness of who the learner is, the learning process, and how learning occurs in relation to the social environment (peers and faculty/staff)
- Educators' appreciation of the physical environment in which they work
- Researchers' recognition of what comprises the learning environment

In other words, designers need to understand that the places they create are to be inhabited by users who will not only be influenced by the design but, in turn, will also shape the way these places function. And just as designers must understand that the physical environment evolves in relation to the people situated in it, educators and researchers must acknowledge that the physical learning environment assists them in providing opportunities for learning to take place. The physical environment must be understood as a stage that can unfold into a variety of places where learners can perform. Given this, the physical environment is flexible and can be rearranged routinely with the appropriate props, resources, and tools to support a variety of settings that encourage the diverse ways in which learners appropriate knowledge for themselves.

For this reason, the book examines and critiques the current practice of design professionals. Chapters 1 through 3 explore normative theories in architecture, recognizing that change in the current practice of design begins with creating a *culture of inquisitiveness*; offers the reader the *responsive approach*, the ideal, for programming, planning, and designing learning environments; and considers *responsive commissioning* as the research method for acquiring knowledge about learning environments. While Chapters 1 through 3 consider alternative approaches for design professionals, Chapter 4 provides a social history of school design in the United States. This overview points out which current *trends* and *innovations* have their foundations in progressive concepts from the twentieth century. While Chapter 4 acknowledges how the physical environment can be designed to support alternative pedagogies, Chapter 5 examines the history of technology in the school setting. From this, the reader may become aware that the use of technology in the learning environment is not new. As the reader questions the integration of technology in the built environment, this chapter provides a recent study on technology that evaluates the constraints and affordances of technology. Whereas Chapter 6 establishes *practice theory* as the perspective

for programming, planning, and designing learning environments for the twenty-first century, Chapter 7 points out that the ideas grounding practice theory, where the learner and the learning environment are both viewed as *active*, are rooted in the Reggio Emilia, Montessori, Waldorf, and Central Park East Schools.

Chapters 1 through 7 provide the groundwork for Chapter 8. Chapter 8 not only evaluates the constraints and affordances of small learning communities, small schools, large schools, and learning communities but, most importantly, provides guidelines and a pattern language for the design of learning communities that is grounded in the research on the situated nature of learning. Building on these guidelines and pattern language for designers, Chapter 9 presents 22 case studies of learning communities contributed by various architectural firms that aspire to be responsive from the Northeast, Southeast, South, Midwest, Southwest, and Northwest regions of the United States. Lastly, Chapter 10 reports the findings of research interviews with 10 educators and planners who provide insights into twenty-first-century learning environments and their thoughts on what is needed for the next decade and beyond. Interestingly, this research, though not comprehensive, supports the information presented in the previous chapters.

While *Evidence-Based Design of Elementary and Secondary Schools* is not the definitive book on learning environments, it does offer a unique perspective on issues that design professionals should consider if they intend to design places where people learn. Furthermore, this book offers insights for educators and researchers about the design process and how learning environments can be created to assist the faculty/staff, the learner, learning, and the things to be learned. Furthermore, this book is a reflection of the ideas presented. It was written with a community of people who endorse the notion of a culture of inquisitiveness.

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This book is the culmination of questions and thoughts that were formulated with Norma Leutzenger, who allowed me to become fully engaged as a teacher in her classroom; James A. Dyck, who encouraged me to write so that I might share these ideas about the learner and the learning environment with designers; and the students whom I have been privileged to teach. Lastly, I would like to thank all the architecture, design, and educational facility planning firms that contributed examples of their projects; JCJ architecture, which supported me on this journey; the educators and researchers who shared their beliefs about schools today and the learning communities of tomorrow; and everyone for the time they gave to me to make this book a reality.



# chapter 1

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## Where Does Evidence-Based Design Fit in the Design Process for Creating Responsive Learning Environments?

### INTRODUCTION

Evidence-based design (EBD) is a research-based approach for the design professional. This approach, which is rooted in the design of healthcare facilities, is used to understand how the built environment influences individuals' behavior. It is used to develop research information that provides a framework for programming and planning healthcare, hospitality, commercial, and educational facilities, to name a few. Although EBD is grounded in empirical research (Center for Health Design, 2008), it is focused on building technology systems, information technology systems, and building maintenance programs. This approach, however, is limited to evaluating how these systems and programs affect building occupants. It does not generally embrace a more holistic approach that emphasizes the integration of social development as part of the relationship between humans and the built environment.

Complicating the integration of a more holistic approach for EBD is the inclusion of green design strategies as part of the design process. Interest in green

design strategies, which include issues such as indoor air quality, acoustics, indoor environmental quality, and daylighting, has skyrocketed over the last 15 years. Creating green buildings is an international phenomenon. To a great extent this contemporary movement, like others, is being led by technology and its promoters. Although technology has contributed tremendously to the development of human/environmental design solutions, it has also led to a fragmented approach to the creation of learning environments. Additionally, the inclusion of building and information technologies may be characterized as an *easy fix*. Any and all educational facilities may incorporate them. However, this fix simply reproduces patterns of architecture that are driven by existing building and information technologies rather than being planned with a central interest in how occupants and others concerned with the process are involved in creating, defining, evolving, and transacting with these technologies. Lastly, the incorporation of these systems does not correlate with creating a place that can be described as active or encouraging learners to become fully engaged in the problems at hand.

From this, EBD may be described as embracing a perspective more in tune with *architectural determinism* (Bell, Greene, Fisher, & Baum, 2001). Architectural determinism accepts as true that the physical environment influences behavior. This theory does not consider how the social conditions affect behavior. It is a stimulus-response approach to human–environment relationships. This approach may be appropriate for healthcare facilities, but educational facilities must go beyond this framework and consider the notion of *congruence* in the daily practice of designing learning environments. Not only must EBD consider how the design of place addresses the needs of the staff and students, but it must also deal with the fit between individual and collective behavioral goals and aspects of the physical environment. EBD must view the physical environment as an evolving system with subsystems that should be readily and inexpensively rearranged or replaced in response to changing human goals and external conditions (Michelson, 1976). However, maintaining congruence and matching people to well-fitting environments is not a static approach, specifically in learning environments, where the motivations to be in these places are unique for everyone who transacts within them.

Based on this brief overview, EBD cannot truly be considered a new approach, but rather must be understood as building on theories, concepts, and research methodologies developed and used in the behavioral sciences, specifically in the field of environmental psychology. Researchers in environmental psychology have examined the learning experiences of students in small schools, as well as classroom design, open plan schools, and windowless schools, to name a few. However, the findings have had limited influence on the design profession in determining how learning environments are programmed and planned. The question must be asked, how, why, and where does EBD fit in the creation of learning environments? The purpose of this book is to provide a framework for integrating EBD in the daily practice of the educational facility planner, designer, and architect who plan learning en-

vironments. By incorporating research routinely, the hope is that the industry will embrace a *responsive approach* to the design of these places. This book:

1. Examines the current practice and theory guiding design
2. Provides a definition of a responsive design approach
3. Offers research methodologies that can guide the programming, planning, and design of learning environments
4. Explores the history of school design and technology in learning environments
5. Puts forth practice theory as a model for designers to consider when programming, planning, and designing learning environments
6. Identifies twentieth-century teaching methods that are guiding twenty-first-century learning environments
7. Builds on research to develop a theoretical framework for analyzing learning environments
8. Provides case studies that may be characterized as following a responsive design approach
9. Considers what learning environments may be in the next decade and beyond

## THINKING BEYOND THE AESTHETIC

Building public schools in the United States has become a specialized practice in which the architect can potentially evolve from an artist whose interest is in the exterior aesthetic to a leader in the field who not only values and appreciates design but, most importantly, understands how people acquire and master both informal and formal skills. Furthermore, with the pressure from clients to design public school buildings that reflect twenty-first-century ideals and values, the architect must lead in the creation of *innovative* places where learning can occur. Unfortunately, architects have a



dilemma. The process for completing a project may be guided by budget and schedule concerns. Consequently, over the course of their careers, architects may have developed only minimal necessary skills to design the physical environment. Furthermore, this training is limited to developing an image for the institution and coordinating the numerous systems needed for its operation.

While design professionals should have these skills, they must also be trained to analyze research on how people learn and transfer this information to the design of places that promote learning. If design professionals desire to advance their role from merely building to understanding how learning occurs, they can become agents of change in the creation of this particular building type. The goal of this chapter is to raise issues about the design process and begin a dialogue to examine the architect's current role and how it might evolve. This chapter will:

1. Define the term *theory* and describe it in relation to the conceptual positions guiding the design of the physical environment. These positions may be characterized as *normative theories*.
2. Provide a brief analysis of the developments that influenced the design of school buildings in the twentieth century.
3. Identify EBD as a tool for assisting the design professional.
4. Describe primary and secondary environments as places where learning occurs.
5. Offer the basic elements for understanding who the responsive designer is.

## NORMATIVE THEORIES

Over the last few years of working professionally as an architect and teaching in a university architecture school, I have encountered individuals who use the term *theory* to describe their *concept* for a project.

This is troubling to me. While the designer may have a thoughtful concept, he may not have developed a theoretical perspective. According to *Merriam-Webster's Online Dictionary* (1985), a theory is "a plausible or scientific acceptable general principle or body of principles offered to explain phenomena" (p. 1223). While a theory explains a particular phenomenon, the concepts that frame the theory test, build on, and reinforce the empirical findings unveiled by earlier accomplishments in a specific field of study. Furthermore, the findings from the research may be generalized to develop hypotheses that advance the theoretical perspective in a specific field of study. Hence, a theory is derived from research that describes a scientific body of rules, ideas, principles, and techniques that concisely and clearly explain and potentially extend particular phenomena.

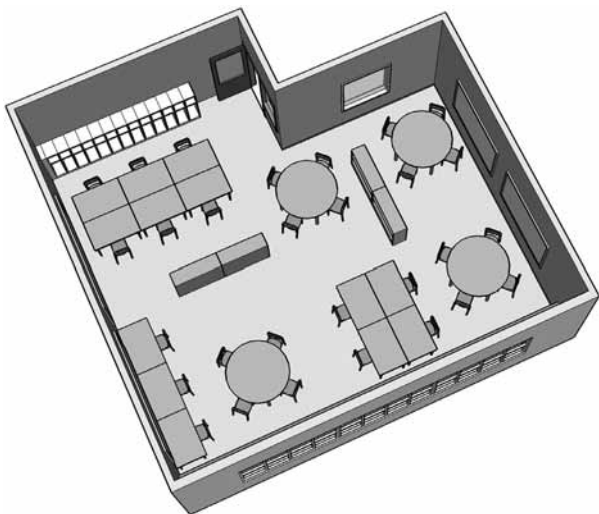
Because a theory is not merely the development of concepts but is grounded in empirical study, theory in the practice of architecture is limited. In practice, the concepts of design are guided by normative theories (Lang, 1988). Normative theory is "concerned with descriptions and explanations of the positions that architects and others have taken on what good architecture is, on what attitudes architects should take, and how architectural praxis should be conducted" (Lang, 1988, p. 206). Moreover, designers have a highly general, vague, and imprecise vocabulary for describing, defining, and evaluating their assertions. If this were not enough, there are additional inconsistencies between the position of the designer and the actual practice of architecture that include the following:

1. The architect's position is not accepted or valued in the marketplace.
2. The designer's position was developed before implementation. Since the position was never implemented, the consequences of having no practical experience were unforeseen (environments that do not assist teachers and teachers are blamed for spaces that do not work).
3. The intentions of the design are treated as separate from practice.

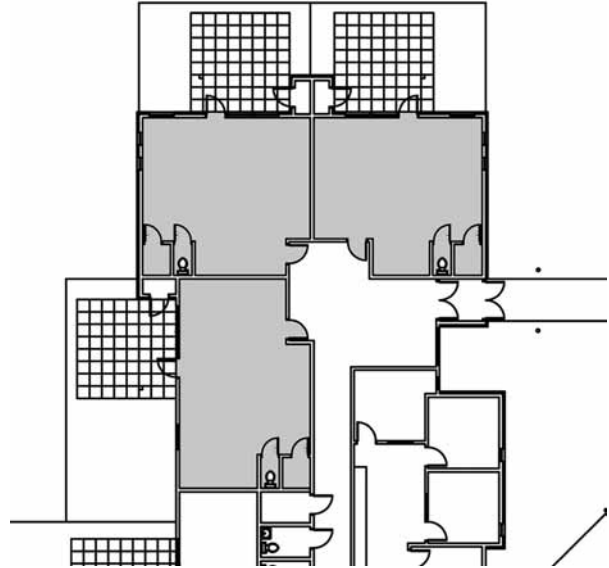
4. The architect did not have the design skills to put his intentions into practice. (Lang, 1988)

**1. Position not accepted or valued in the marketplace:** This might take place when a concept for the design of the plan or elevation is presented to the owner. Even though the concept may have been integrated not only in the designer's own work but, more importantly, in past precedents, it is rejected. The owner may have rejected it for a variety of reasons. The owner may not want to take a risk on a concept with which he or his colleagues are not familiar and/or he believes his stakeholders will not support it.

In the design of learning environments, the concept of the *L-shaped classroom* is questioned by many architects and educators as an inappropriate design for learning (Fig. 1.1). Since the shape of the plan for this room takes the form of the capital letter L, where both branches are of nearly equal length and depth (Dyck, 1994; Lippman, 2004), architects and educators believe that the addition of the inside or reentrant corner will encourage unwanted behavior. Teachers located at the front of the classroom feel unable to



**Figure 1.1** Is the L shape an appropriate or inappropriate classroom design? *Curtis Gibbs*



**Figure 1.2** L-shaped classroom cluster applied in kindergarten and first grade (Winston-Salem Montessori School, Winston-Salem, North Carolina). *The Architectural Partnership*

control the unwanted activity. Meanwhile, this design pattern has been integrated knowingly as well as unknowingly in the plans of many elementary school classrooms throughout the United States (Lippman & Gibbs, 2007). In kindergarten and first-grade classrooms, the L shape is created when a toilet room is incorporated into the rectangular setting (Fig. 1.2).

**2. The position was developed before implementation:** In this scenario, the architect takes an authoritative position for the design of the project or elements of the design. However, the position is not fully grounded in research. Rather than examine all the affordances and constraints of this position, the architect prepares a design that is immediately built. Over time, issues are uncovered demonstrating that the position was not fully developed and that it compromised the activities that needed to take place on a daily basis.

Windowless classrooms provide an example of a concept that was implemented before the research on affordances and constraints was examined. Guiding

the design for windowless classrooms was the concept that settings without windows would promote a more focused learning environment. Since they wouldn't be able to look out of windows, students would have fewer distractions and could better focus on the information dispensed by the teacher (Rivlin & Wolfe, 1985). This design would also provide additional wall space where students would be able to display their work. However, the research about these environments was limited and clearly indicated that additional studies were needed to determine their advantages and disadvantages.

Furthermore, the designers who provided municipalities with the concepts for windowless classrooms may not have considered the indoor environmental quality, health issues, or maintenance issues needed to sustain these environments. These settings are completely dependent on mechanical and electrical systems. The filters for the heating, ventilation, and air conditioning (HVAC) equipment must be changed routinely to ensure clean air for the users. In addition, these settings rely on fluorescent fixtures for lighting. Over time, the lighting levels of fluorescent bulbs diminish. Since these bulbs provide the only source of lighting in these environments, they must be changed routinely to afford a more even distribution of the artificial lighting for creating appropriate learning spaces.

With current research indicating the positive effects of natural lighting on learners' test performance, attendance in school, and attitudes about their physical environment, the incorporation of glazing in the façades has become an essential premise of design solutions. While this position is grounded in research, designers must continue to reconcile the issues associated with glazing, which include how it is integrated into the design, glare, shading, and the use of high-performance windows. Lastly, guiding this position of the integration of glazing throughout the building are green design principles. However, this position also recommends designing structures that are *tight*. These principles should be questioned because, not unlike windowless schools, the solutions create places that

are overly dependent on technology for maintaining the indoor environmental quality.

**3. The intentions of the design are treated as separate from practice:** This occurs when there is inconsistency between the completed design and the educational program. There are a number of architects who proclaim knowledge about the most appropriate designs of learning environments and feel that they understand the best practice for how spaces should be designed to encourage learning. However, the completed projects have spaces that impede the educational program. These spaces are not designed to assist the users, but instead create obstacles to teaching and learning.

For example, in the 1960s, the open-planned school was touted as the ideal place for learning. This approach was also grounded in constructivist learning theory, which states that students should be encouraged to become active learners. In these settings, students would be able to choose what, where, and how they will learn. Since these environments were planned as warehouses, students wandered throughout the space as teachers tried to structure their settings for learning activities to occur (Rivlin & Wolfe, 1985; Weinstein, 1979). The spaces were not practically designed to assist teachers in transferring knowledge to their students. Moreover, students were unable to become fully engaged in learning activities because they were distracted by the interactions going on around them. As a result, teachers constructed elements in the environment to allow them to organize their settings to facilitate teaching and learning (Rivlin & Wolfe, 1985; Weinstein, 1979).

While the concept of the open-planned school appeared to be grounded in educational research, designers were not able to translate the findings into places that assisted teaching and learning activities. Furthermore, the research guiding the designers considered the learner, but not the social environment or how the physical environments needed to promote opportunities for the community of learners. Given this, the open-planned schools might be described as passive settings, since the spaces did not support the intended

learning activities for either the individual or the community, but rather afforded distractions to students and teachers alike.

**4. The architect does not have the design skills to put his intentions into practice:** Even though the design professional may have examined research on learning, the things to be learned, and the learner, he may not be able to interpret these concepts into places that promote opportunities for learning. While the design professional recognizes the value of integrating technology in the design of the school, the places that are proposed, for the most part, do not take advantage of how the technology might be used. The settings created are reproductions of models that were created during the twentieth century. In lieu of the blackboard, a smart board is placed. In this setting, rows of chairs are arranged facing the smart board, which is the focal point of the room (Oliver & Lippman, 2007). The layout of the classroom design continues to reinforce the notion that learning is passive, whereby the student sits and takes in information from the teacher, who dictates from the front of the room how activity in the space will ensue.

Normative theories are not scientific and are derived from a set of values of an individual or individuals that have specific positions regarding the practice of architecture. Furthermore, the positions of the design professional may not consider how people transact with the places in which they learn, work, and play. By following this particular belief system, the design professional involved in the design of schools knowingly or unknowingly may be misleading her clients in demonstrating how spaces are designed to promote learning (Lang, 1988). This is because her approach to the design of the school environment is not grounded in a theoretical perspective, but rather is derived from the intentions of the design professional who has not (1) researched the history of school design, (2) examined learning theory, and/or (3) evaluated the transactional relationship between the design of school settings and how people learn.

## CHANGING THE ROLE OF THE ARCHITECT

The role of the design professional in the twenty-first century has diminished. This may be attributed to having a profession that is grounded in normative theories. It may also be attributed to the projects that architects are designing. The projects have become more complex and require greater attention to the coordination of the numerous technologies that need to be integrated into the building. With the greater complexities, architects in many cases are required to have consultants on the project in addition to the typical structural, mechanical, electrical, and plumbing engineers. These additional consultants might include specialists in exterior walls, acoustics, theaters, green design, kitchens, and elevators, to name a few.

It is no wonder that the design professional's role has been reduced to designing the exterior skin of the building and coordinating the work of the numerous consultants involved in the project. The result is the creation of "decorated sheds" (Ritter, 2002), boxes with *aesthetically pleasing* elevations that have been designed around a particular normative theory, whim, or the most current style. Rather than being a vehicle for creating settings and backdrops that maintain and reinforce the values of society (Habermas, 1997; Ward, 1992), the design professional who is truly interested in designing learning environments must extend his knowledge of these places.

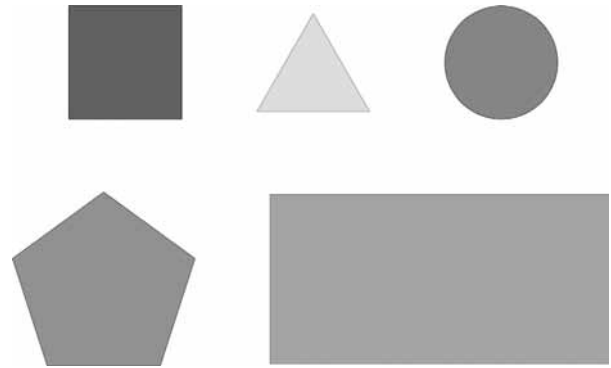
Instead of reproducing objects that are designed to maintain and reinforce the values of society, the design professional may reposition herself from an artist to an academic and intellectual who is rigorously working toward resolving issues that extend beyond an aesthetic where places are structured to promote opportunities for human development (Allacci & Lippman, 2007; Lippman, 2002). By grounding ideas for the design of learning environments in historical precedents, in the affordances and constraints of these places, in the consistencies and inconsistencies of the

plan with the educational program, and in the research on how people acquire knowledge, designers have the potential to be agents of change. However, without this knowledge, the design professional is at a disadvantage in resolving complex issues with respect to the overall plan of the physical environment. The designer can become an agent of change in planning and programming learning if her reasoning is grounded in an understanding of how people transfer and acquire knowledge.

While normative theories have influenced and continue to influence how learning environments are designed, research may be used to inform how the architect designs schools. Such research includes how schools may be planned to encourage learning and provides a grounded approach for the design and design advancement of these places. Research can provide a framework for the design, and it positions the architect with the knowledge for developing a solution that is aesthetically pleasing, incorporates the appropriate technology, and is congruent with the needs of the people who will be using these places. An approach for the design of the physical environment grounded in research may be understood as responsive to the needs of learners and their social environment. This responsive approach can provide designers and their teams with a basis for their recommendations to the client if it offers the following: descriptions of the situation, analysis of the issues, potential resolutions of the issues, and, finally, recommendations on how these resolutions may be applied in other locations.

## INNOVATION IN DESIGN: HISTORICAL OVERVIEW

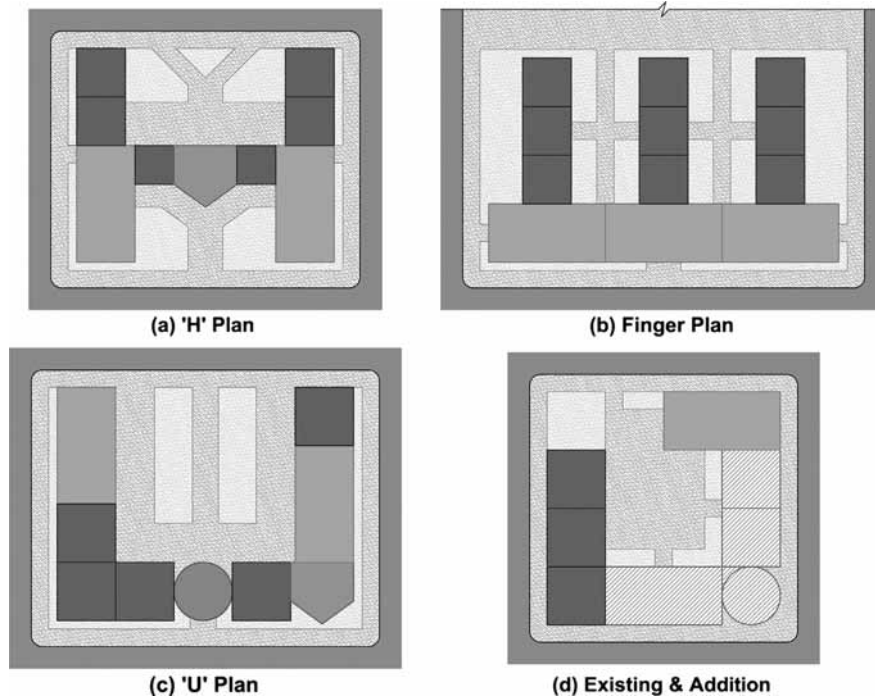
During the twentieth century, the school building became the milieu where children were educated. Whereas some of the designs were driven by theories about how people learn, for the most part the



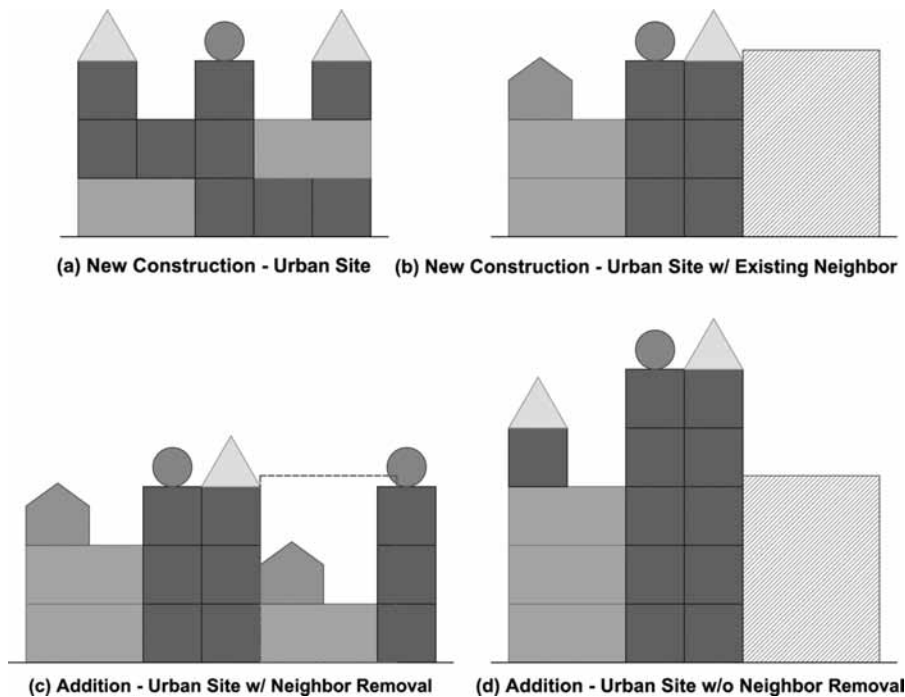
**Figure 1.3** Architectonic elements used as a kit of parts for planning a school. Architect: Peter Lippman. *Marius Calin*

planning and organization of the buildings were influenced by advances in construction technology. The building and its systems can be understood as a *kit of parts* that could be assembled and reassembled in a variety of ways, depending on site conditions (Fig. 1.3). Not only could these systems be reconfigured, depending on the site, but parts also could be added horizontally or vertically when the school needed to expand (Reiselbach, 1992; Rivlin & Wolfe, 1985). Hence, these kits of parts were adaptable, and could be reproduced and extended across settings, depending on the site conditions and expected population growth (Figs. 1.4 and 1.5). Furthermore, the kit-of-parts approach tended to occur in the public realm, where the driving ideology was to structure the physical environment to best limit unwanted student behavior (Rivlin & Wolfe, 1985).

While many public school buildings in the twentieth century were organized to standardize behavior, there were also school buildings that were planned in response to the research on how children develop. These places, for the most part, were private institutions or were shaped by an individual's vision of place and how such a place would promote learning and the mastery of skills. Some of these developments that



**Figure 1.4** Kit of parts arranged horizontally in plan for understanding how the pieces fit. Architect: Peter Lippman. *Marius Calin*



**Figure 1.5** Kit of parts organized vertically in elevation for understanding how the pieces come together. Architect: Peter Lippman. *Marius Calin*



were manifest in the physical design included graded classrooms organized around different ages that coincided with the developmental levels of students; schools as centers of communities, allowing daylight to penetrate all spaces of the building; and a landscape designed around the school to promote opportunities for learning (Bissell, 1995; Hille, 2011; Rieselbach, 1992).

Although these developments in the design of public schools were ongoing in the United States throughout the 1950s (Hille, 2011), most design professionals currently in practice are unaware of them. Many design professionals are revisiting these same developments and claiming their designs as *innovative*. Unfortunately, no evaluation of why these innovations ceased to advance or were replaced by different developments has occurred. Without this knowledge, critical analysis of these innovations in terms of their affordances and constraints on opportunities for learning cannot take place and advance our understanding of school design.

The professional who specializes in the design of learning environments encounters a conundrum. He can plan buildings that begin to embrace the research on learning as reflected in *Architectural Record* (2008, 2009) or he can continue to reproduce what has already been done. In either case, architects are marketing their designs as examples of settings that reflect innovation in design. These settings integrate technology for energy efficiency and for teaching students. In addition, the innovation is driven by particular beliefs concerning how these school settings are planned to promote learning. Regrettably, these positions may not necessarily be guided by how people acquire knowledge, or by the understanding that learning occurs in relation to both the social and physical environments. Upon review of what has been designed and built, even with these innovations, the designs for school buildings throughout the United States are largely found to be mere re-creations of the paradigms unveiled in the twentieth century.

## EXTENDING DESIGN: A RESPONSIVE APPROACH

Although school building designs for the twenty-first century are being reproduced from earlier typologies, these buildings, for the most part, are not developing in relation to the research on how people learn. This research indicates that people appropriate knowledge for themselves from their transactions with others and with their environment in real-life and authentic situations. The planning of schools must be examined to inform administrators of educational facilities, facility managers, educators, design professionals, and all potential users of the facility of how these places might be designed to be congruent with the needs of the users.

### Evidence-Based Design

The term *evidence-based design* (EBD) is specific to the process of basing decisions about the built environment on research (Center for Health Design, 2008). The goals and methods of EBD are grounded in the scientific method of qualitative as well as quantitative research and data analysis. The basic approach of EBD includes the following:

- Examining the existing research literature to determine pertinent findings and recommendations
- Evaluating referenced findings with data gathered from site visits, subject matter experts, and stakeholders
- Hypothesizing the potential outcomes of design decisions and tracking the implications of the design implementation (Looker, 2009)

An example in the context of the learning environment design (e.g., L-shaped) might begin with a review of published research on this design as well as decisions made on similar past projects, followed by interviews with the staff, students, and parents. The results of

this research would drive the design decisions, for example, to provide effective collaborative working space as well as independent working areas in a classroom. Outcome factors, such as teacher and student satisfaction ratings and the ability to manage interactions, might also be established and subsequently measured. The EBD research approach may be described as an authentic and pragmatic one. This method, consisting of gathering different types of data from different sources and then looking at the findings across the data sources, is comparable to the triangulation approach, in which both quantitative and qualitative findings are analyzed to identify appropriate design guidelines for effective, usable results. Both qualitative and quantitative methods will be described in more detail in Chapter 3 in the section “Research Methodologies.”

### **Evidence-Based Design and Developing a Responsive Approach for Creating Learning Environments**

*Environmental psychology* is the study of how the physical design is shaping and being shaped by work processes, an organization’s culture (e.g., formal and informal values, norms, expectations, policies, and practices), workforce demographics, and medical and information technologies (Becker & Steele, 1995). From the social network perspective, knowledge emerges and is sustained in a social context (Cross, 2006; Cross & Parker, 2004). The communities of practice framework (Lave & Wenger, 1991; Wenger, 1998) emphasizes that informal learning and knowledge distribution depend on connections among people who share a common interest or task. For example, Brown and Duguid (1991) discovered that customer support staff acquired knowledge not from formal training or by reading company manuals, but rather from the experience and insights of others with whom they worked. Learning therefore occurs through participation rather than through the passive acquisition of knowledge. This is also the primary mode by which learners master skills and acquire knowledge

to become competent members of a team (Lesser & Prusak, 1999).

Building on this knowledge, questions must be addressed about whether or not existing and new facilities perform as intended to encourage participation/engagement: How are the spaces being used by the teachers and the students? Is the design of the spaces aligned with the pedagogies being used? Were the spaces organized to promote formal and informal learning? Were the spaces planned around ideas relating to learning, things to be learned, and the learner? What architectural precedents were used to inform the design team? What educational models and/or theories were used to guide the design team? A responsive designer (1) is able to describe, examine, and analyze the needs of the users, (2) considers the possibilities of what may happen in a place, (3) is aware of and can evaluate the research on education, (4) promotes a design that is congruent with the needs of the users, and (5) recognizes that every site is context specific and that each setting should be designed for each context.

### **PLACES FOR LEARNING: PRIMARY AND SECONDARY ENVIRONMENTS**

All places in which individuals transact may be considered learning environments (Wenger, 1998). Throughout our lives, we have transacted in numerous places where we have learned both formal and informal skills. These places may have included the home where we grew up, the neighborhood park where we played with our friends, the community center, elementary school, high school, and college, the zoo, the museum, church, temple, mosque, movie theater, and football or baseball stadium, to name a few. Some individuals may remember learning in their homes from their families, others may recall developing skills as they played with their friends in the schoolyard or park setting, and still others may have mastered skills in the neighborhood library or community center.



While school settings are recognized as the places where we acquired knowledge and mastered various skills, these are probably not the only places where we have learned. According to Bell, Greene, Fisher, and Baum (2001), the places that we live, learn, and play in may be categorized as primary and secondary environments. *Primary environments* promote opportunities for people to meet regularly, develop personal relationships, and participate in a variety of fundamental goal-directed activities. *Secondary environments* are places where the relationships are essentially temporary and anonymous (Stokols, 1999).

The places that may be described as primary environments include, but are not limited to, the home and the areas around the home that may be defined as the *neighborhood*. The milieu of these settings promotes both constraints and affordances for the individual. The constraints may be understood as the structure for these environments. The affordances may be understood as the found opportunities for individuals to become engaged in activities of choice. By having choices in what, how, and where they acquire knowledge, people are more likely to reflect on their experiences and to develop an understanding of how they resolve issues through specific tasks (Lippman, 1995).

In primary environments, individuals are engaged by others in goal-directed activities. In the home, they learn how to drink from a glass, tie their shoes, and talk. These engagements do not occur in isolation but rather develop in relation to other family members. Additionally, these engagements involve the child working with one or more other people who are more skilled in these activities. The child is not peripherally engaged in the tasks at hand or is not being told how to perform them but rather is a full participant. These engagements involve not only the development of practical skills through implementation and accomplishments but also observation of what others are doing and sharing knowledge with others (Lippman, 1993, 1995).

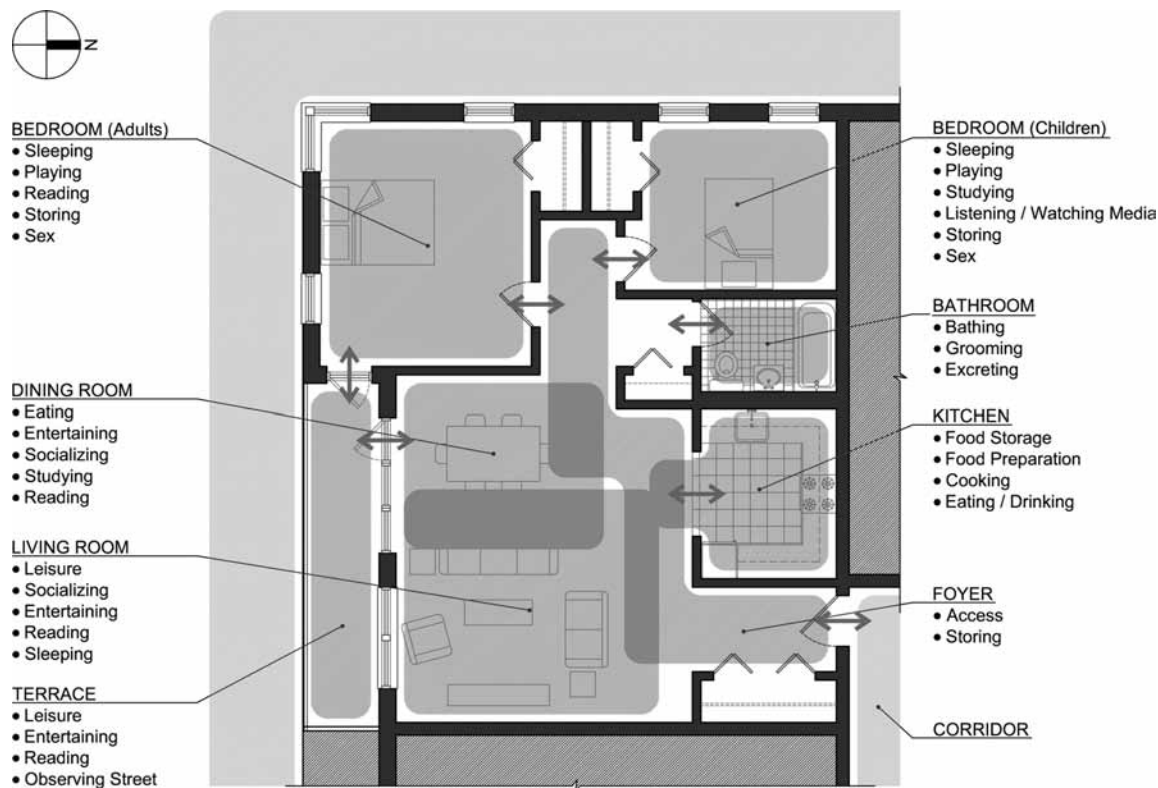
The dynamic of the learner in relation to other people in the home is mediated by the physical envi-

ronment (Fig. 1.6). The physical environment is organized with interior partitions that separate private zones from public zones. While the entry, living room, dining room, and kitchen may be considered the public zones, the bedrooms and bathrooms are recognized as the private zones. Similar activities occur in the public and private zones, including eating, sleeping, playing, and watching television. Whereas the activities that occur in the public zones tend to involve group interactions, in the private zones, for the most part, they consist of individual engagements.

Furthermore, the dynamic of the home is mediated by the way in which the furniture is arranged and rearranged. Depending on how the furniture is arranged, the physical environment can support individual, one-to-one, and group interactions (Lippman, 2002, 2004). At any one time, the home may have a variety of transactions occurring in each of the zones. The environment may therefore be understood as flexible, and since all persons are aware of the activities going on around them, the environment may also be described as *integrated*.

Like primary environments, secondary environments have defined spaces, and may be understood as being flexible and integrated. Whereas the activities that occur in the primary environments are more *informal*, the engagements in the secondary environments tend to be more *formal*. Secondary environments may afford passive and/or active learning opportunities. For example, religious facilities and community centers are places that are planned around multiple spaces, providing opportunities for both passive and active engagements. When people are in the auditorium spaces listening to a concert or presentation, they are passively engaged. However, when they are dancing in the fellowship hall of the church or playing basketball in the gymnasium of the community center, they are fully engaged in the activities at hand.

Office environments may also be described as secondary environments. There, individuals are in the process of developing skills that may be transferred across and between settings. In these settings,



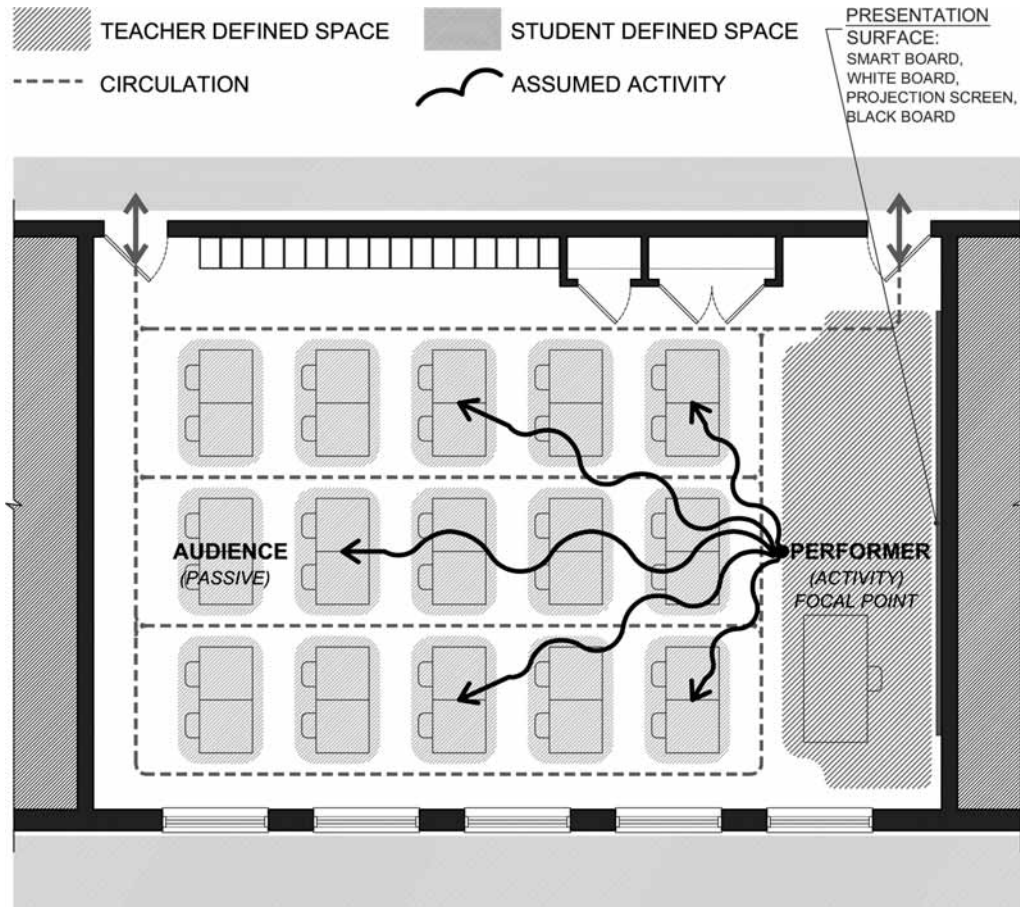
**Figure 1.6** Primary environment: the home setting showing possible spatial arrangements and anticipated activities that might occur in each room. Educational Resource Planner: Peter Lippman. *Marius Calin*

individuals work collaboratively and individually as they complete their assignments. Like religious institutions and community centers, offices are planned to support a variety of activities that occur on a daily basis. Spaces need to be flexible and integrated to support individual, one-to-one, small-group, and large-group learning opportunities (Brill, Weidemann, & BOSTI Associates, 2001).

School environments must not only have the qualities of religious institutions and community centers but also must provide a variety of learning opportunities for the diverse ways in which people acquire knowledge (Fig. 1.7). Unfortunately, most learning environments have not been designed to address

the variety of ways in which people acquire knowledge and master skills, but rather, they have been designed to control unwanted student behavior. Furthermore, teachers play an authority role that includes enforcing rules along with distilling normative information.

The overall physical layout to accommodate the student population reinforces particular engagements. Instructional zones are typically organized like an egg crate (Kennedy & Morre, 1998), a double-loaded corridor with classrooms on either side. Whereas corridors are designed for activity, classrooms are typically designed for passive engagements. Corridors are planned so that users can move quickly from one location in

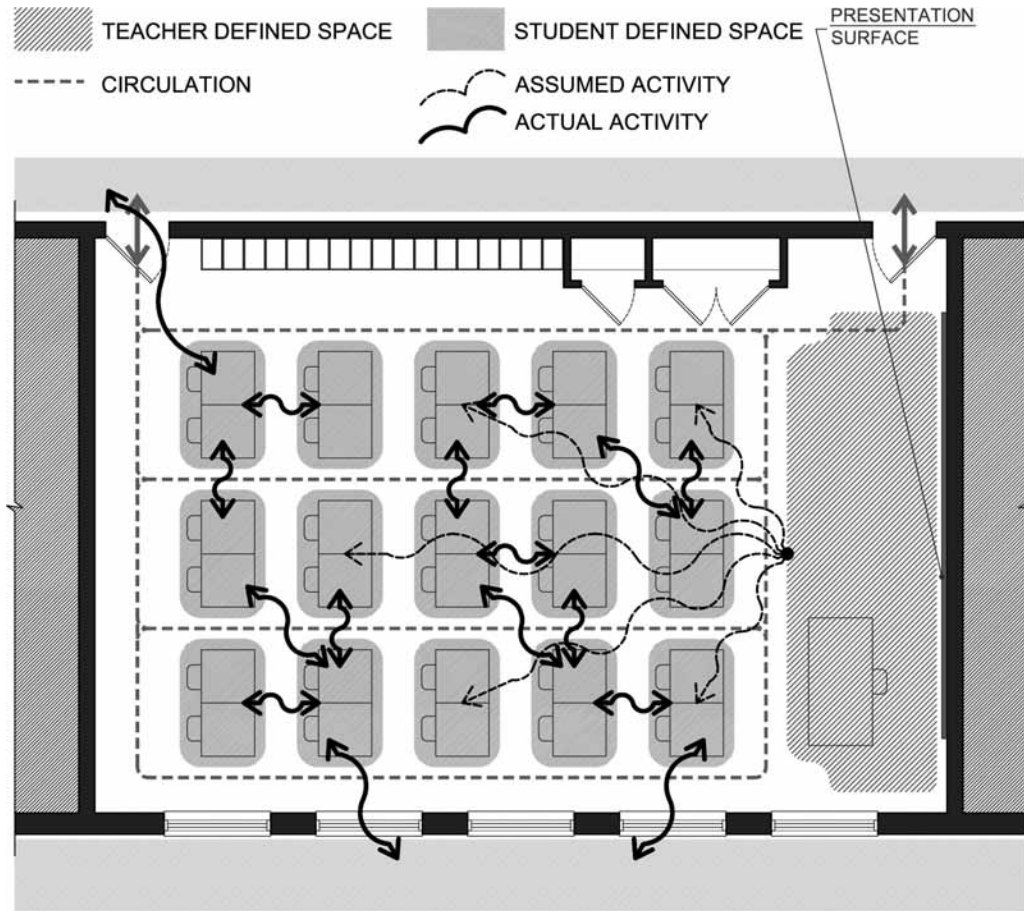


**Figure 1.7** Secondary environment: the layout of the traditional classroom where the teacher is the performer/focal point of the learning environment. Architect: Peter Lippman. *Marius Calin*

the educational facility to another. However, other activities also occur in these spaces: waiting to enter a classroom, studying, reading, and accessing lockers (Deasy & Lasswell, 1985). Classroom spaces promote passive engagements (Fig. 1.8) in which students acquire information from their teachers (Bissell, 1995; Rivlin & Wolfe, 1985). If students are to acquire practical skills, the organization of both corridors and classroom spaces need to be reevaluated as layered environments that promote individual, one-to-one,

small-group, and large-group transactions (Lippman, 2007a, 2007b, 2007c).

While the goal of the home is to teach children skills for their entrance into the school environment, the goal of the secondary environment is to provide individuals with knowledge that may be transferred to other settings. The knowledge allows the individual to describe, evaluate, question, and generate hypotheses for resolving the issue at hand. In addition, knowledge affords individuals the opportunity to analyze each



**Figure 1.8** Secondary environment: potential activities occur routinely in a traditional classroom where the teacher is the performer/focal point of the learning environment. Architect: Peter Lippman. *Marius Calin*

situation and develop the appropriate solution for a given endeavor (Lave & Wenger, 1991). School environments should be evaluated for their affordances and constraints. They should be understood not only as places that are flexible and integrated but, most importantly, as places that encourage, support, and allow the learners to acquire knowledge and develop practical skills while engaged with their social and physical environments.

## EVALUATING SETTINGS AS PASSIVE AND ACTIVE

While an understanding of primary and secondary environments does not provide a clear direction for how to plan learning environments, it does provide the designer with insight into how people learn and the places in which they learn. Like the learner, the learning environment may be described as passive or active

(Bowler, Annan, & Mentis, 2007). However, we need to take this analysis one step further and understand that the learning environment is composed of a social environment and a physical environment, both of which may also be described as passive or active. This evaluation of the learner, learning, and the places in which learning takes place informs the design professional of how places may be planned. Places may be planned to encourage the learner, the social environment, and the physical environment to be active or passive. Moreover, learning environments can be planned for activity in some areas and passivity in others. For example, the setting may be designed to promote active learners, an active social environment, and a passive physical environment.

This brief evaluation of activity and passivity in the learning environment will be examined in greater detail in subsequent chapters. However, these concepts only begin to address the notions of what a responsive design approach embraces, relying on a rethinking of the design. Furthermore, this approach reflects the most challenging aspect of designing learning environments, primarily because its success depends on every design team member's commitment to, participation in, and understanding of this fundamentally different process. Currently, few resources are available to help guide teams wanting to learn how best to manage such a design process—or even where to begin. This book will describe the nature of the change required of the current practice models by defining a strategy that design teams should utilize in the design process.

The concepts that will be examined as part of this first process of identifying relevant issues include research, learning theories, learning and mastering formal skills, transforming everyday concepts into scientific concepts, the role of the social environment, the structuring of the physical environment, the social patterns for the design of learning spaces, the physical patterns for the design of learning spaces, the situated nature of learning, levels of participation, learning communities of practice, the place of technology

in learning spaces, rethinking the role of sustainable architecture in the design of learning environments, and the mediated relationship between learning within both the social and physical environments.

The next chapter will illustrate how the design professional may become engaged in the research process and when this education might begin. From research, the appropriate questions may be examined in the programming phase. Once the questions are identified, they will be used to gather information from administrators, teachers, facility managers, and board members, as well as other potential users of the spaces. After the data are collected, they will be analyzed to uncover common themes. From these themes, a written brief describing the specific learning environment may be developed that sets the foundations for the space program and the schematic design phase.

The analysis stage for the responsive designer requires early engagement, rigorous analysis, robust and enthusiastic dialogue among all participants, and a working knowledge of the available information. Since no one person possesses all of this knowledge, the role of each team member takes on great importance and responsibility in the responsive approach. All members of the design team must integrate and engage more issues than those within their own discipline's scope of understanding. Simply stated, this means that the nature of the design process for creating learning environments must change.

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