The Walls Still Speak: The Stories Occupants Tell

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Abstract

Accompanying the recent concern for the quality of our nation's educational infrastructure is a growing body of research connecting the quality of school facilities to both student outcomes including achievement, behavior, and attitude as well as to teacher attitude and behavior. Less is known about the mechanisms of these relationships. This study examines the link between school building quality and student outcomes through the mediating influence of school climate. Results of a recent study confirmed a link between the quality of school facilities and student achievement in both English and mathematics. As well, correlational analyses indicated that quality facilities were significantly positively related to three school climate variables: academic press, teacher professionalism, and community engagement. The quality of facilities was uncorrelated to proportion of students receiving free and reduced priced meals, although the quality of facilities *was* strongly related to resource support. Finally, results confirmed the hypothesis that school climate plays a mediating role in the effects of the quality of school facilities on student achievement.

This follow-up study explores the complicated intricacies of how a school building's physical properties influence teaching and learning. The study was structured according to a collective, instrumental case study design. Individual, focus group, walk-through and photo-interviews, as well as observations informed the inquiry. Two high poverty schools, within the upper quartile of facilities quality, were identified from the earlier quantitative study. These two schools, one urban and one rural, were selected purposefully for this study, maximizing learning from cases rich in information. Preliminary results of the research indicate that ongoing interactions between the design and reality of the built environment and the occupants of that environment helped to define the learning climate of these schools. Reciprocally, the climate

helped to shape the interactions that took place, fostering environmental understanding, competence and control and supporting academic learning. From the data, several broad themes related to building quality emerged as central to this interaction between the built environment and building occupants, including movement, aesthetics, play of light, flexible and responsive classrooms, and elbow room.

THE WALLS STILL SPEAK: THE STORIES OCCUPANTS TELL

Taking the Polaroid® camera, Amy systematically moved around the school taking ten photos that she felt characterized the way the school building itself impacted her career as a student at Dell Middle School (all names are pseudonyms). Later, she returned to the research area and organized her photos into categories. Three photographs of doors she labeled, "First Day." During the interview she explained how an imposing and historical structure, much larger than her elementary school, evoked some fear and worry about how she would get along with new teachers and students whom she had never met before. She represented this early trepidation in her photograph of the main school doors and the steps into the building. Her next photograph in this series was of a hallway, and again she addressed the doors, but she pointed her lens down the corridor to capture the immensity of the building. Each door, she explained, led to a room she noted as being of this teacher or that teacher she now knows well. Her final photograph in that series was of one door leading into her first teacher's classroom; the door was decorated with posters, garlands, and flowers, inviting her in and reassuring her that this school, this place, was one where she would belong.

Amy is one participant in a qualitative study of the interplay between school facilities and the occupants of those facilities, the human beings who make the school their home during the school day. A team of three researchers interviewed teachers, parents, administrators, support staff, and students using four interviewing formats at two different schools. Each school was different in substantive ways from the other, but each also shared common traits in the quality of the facilities they occupied, solid performance of students and faculty in spite of significant numbers of students from low socio-economic areas of the community, high teacher

professionalism, and emphasis on academics. We wanted to know what stories the building could tell about the people there and what the people could say about the school building.

The manner in which a school building is designed, managed, and maintained sends a message to its occupants and the community beyond, speaking volumes about the value placed on activities transpiring within its walls. The physical properties of a school building are the tangible context within which teaching and learning take place (Willower, 1988). Students, teachers, parents, and community members come to understand the nature and importance of these primary school functions through their physical representations. When learning takes place in inadequate facilities, occupants fail to perceive a clear focus on academics. The learning environment is less likely to be conceived of as orderly and serious. Teachers are less likely to demonstrate enthusiasm for their jobs and desire to go the extra mile to support student learning. And where school buildings are shabby and poorly maintained, the community is less likely to derive satisfaction from engagement in support of the teaching and learning process (Uline & Tschannen-Moran, in press). As we work to influence the physical environment of a school practically and artfully on behalf of these primary functions, we increase the likelihood that occupants will derive meaning and purpose from the places where teaching and learning take place day to day.

A recent national report, chronicling a decade of public school construction in the United States (Building Education Success Together, 2006), described the scale, scope, and distribution of this recent school building investment. Over the past ten years, public school districts in the United States built more than 12, 000 new schools and completed more than 130,000 renovations and other improvement projects, spending more than $304 billion in capital expenditures (Building Education Success Together, 2006). Along with a lack of access to rigorous

curriculum and highly-qualified teachers, students in poorly resourced districts received the smallest share of this investment in adequate facilities (Building Education Success Together, 2006).

Arsen and Davis (2006) confirmed these findings in a research study that calculated capital stock, and unmet capital investment need, of districts in Michigan. They applied new methods for measuring the existing capital stock of public schools, defining adequacy and estimating the cost of bringing existing school facilities up to an adequate standard. Michigan is one of the few states that provides no state aid to local districts for the construction of capital facilities. Findings indicate that under-resourced districts continue to have the greatest need, even as they pay the highest tax rates. Together these studies help to refine and target earlier estimates of need[1], confirming that many of the nation's most challenged school districts continue to "making do" with poor quality buildings (Mead, 2005, p.1). Even as evidence mounts regarding the detrimental effects these poor conditions have on students and teachers, many school district leaders struggle to convince policy makers and of the need to invest resources in replacing and/or renovating inadequate school facilities. It appears many remain unconvinced about the seriousness of the problem. Deeper understandings of the complicated interplay between the physical and social environments of school, and how these dynamics influence student attitudes, behaviors, and outcomes, may help educators build a compelling case.

[1] According to recent national estimates, twenty-one percent of U.S. schools are more than fifty years old and another fifty percent are at least thirty years old, requiring a total of $127 billion dollars in new construction and retro-fitting (Office of Education Research and Improvement, 2000). A National Education Association (NEA) study placed the need at more than double these estimates, bringing the cost of modernizing America's schools to $268 billion. Add to this $52 billion for technology needs and the total surges to $322 billion (National Education Association, 2000).

Background

This study serves as follow-up to an earlier statewide study of 82 middle schools that examined the relationship of school climate, the quality and cleanliness of the school facilities, and the impact of both on student achievement (Uline & Tschannen-Moran, in press). The proposition examined in phase one of this study was that at least part of the explanation for the link between school building quality and student outcomes is the mediating influence of school climate. It was hypothesized that the quality of school facilities would be related to four factors of school climate: academic press, community engagement, teacher professionalism, and the collegial leadership of the principal. Participants from 82 middle schools in Virginia completed surveys at a regularly scheduled faculty meeting.

Results confirmed a link between the quality of school facilities and student achievement in both English and mathematics. As well, correlational analyses indicated that quality facilities were significantly positively related to three school climate variables: academic press, teacher professionalism, and community engagement. The quality of facilities was uncorrelated to proportion of students receiving free and reduced priced meals. However, the quality of facilities *was* strongly related to resource support, further substantiating findings from recent studies described above (Building Education Success Together, 2006; Arsen & Davis, 2006). Finally, results confirmed the hypothesis that school climate plays a mediating role in the effects of the quality of school facilities on student achievement.

Evidence that school climate plays a mediating role in the effect that school building quality has on student achievement may suggest that certain building improvements and design features leverage stronger results than others. At the very least, design features and building improvements that serve to reinforce and enhance the social environment of school should not be

underestimated in their importance. At the same time we seek to improve science laboratories and integrate state of the art technology systems, we should also pay particular attention to the ways in which various learning spaces encourage or impede daily interactions between and among students, teachers and parents. To facilitate learning, occupants must feel comfortable enough to take the individual and collective risks requisite to meaningful interaction and learning.

In this follow-up study, we sought to explore in greater depth the complex interplay between a school building's physical properties and school climate and how these combine to influence teaching and learning. We were particularly interested in how high quality facilities nurture a positive school climate and high levels of student achievement in schools that serve a primarily disadvantaged (socio-economically) student population.

Effects of Physical Learning Environments on Educational Experiences and Outcomes

For purposes of this study, quality is defined by the perceptions of the inhabitants (administrators, teachers, students, parents, custodians) that the building supports rather than hampers student learning and achievement. Features identified in previous research as potentially related to student achievement, such as perceptions of the building as being attractive, having adequate and appropriate spaces for learning, and being well maintained will be examined. A rich body of research examines the connection between the nature and quality of physical environment and enhanced educational experiences and outcomes. The scholarship stretches across more than four decades, blending divergent strands of inquiry, including sociology, psychology, geography, and architecture, along with education.

Educational Experiences

The quality of school buildings has been related to student attitudes and behavior, and how these affect daily school experiences. Overall, the results of the research suggest that various environmental elements affect self-esteem, peer and student-teacher interactions, discipline, attention, motivation, attendance, interpersonal relations, *and* achievement.

Researchers have conducted projective studies on the effects of attractive versus unattractive environments (Maslow & Mintz, 1956). Worchel and Teddlie (1976) found that environmental props such as pictures improved students' persistence at word tasks, while similar environmental enrichments also increasing persistence on motor tasks (Santrock, 1976). Berlyne (1960) studied aesthetic qualities such as complexity, novelty, surprise and beauty, determining that these qualities stimulate exploratory behavior on the part of research participants. Berlyne's theoretical framework was then applied to educational settings. Studies in preschool settings linked spatial quality in the physical environment to both student and teacher engagement (Kritchevsky & Prescott, 1969). Among school age children, girls appear to prefer bright color arrangements, multidimensional shapes, brighter lighting, and more complex visual arrangements than did boys (Cohen & Trostle, 1990). The addition of indoor windows, opening views between rooms, appeared to positively influence social interaction between students (Biner, Butler, & Winsted, 1991).

The nature of sound and sound attenuation and how these affect learning has also been investigated. Acoustical control matters such as chronic noise exposure have been shown to hinder cognitive functioning and to impair pre-reading and reading skills (Haines, Stansfeld, Job, Berglund, and Head, 2001; Hygge, Evans, & Bullinger, 2002; Evans and Maxwell, 1997; Maxwell and Evans, 2000). The impact of light and various forms of light has also been linked

to behavior and learning (Heschong Mahone Group, 1999; Kuller & Lindsten, 1992; Mayron, Ott, Nations, & Mayron, 1974; Wurtman, 1975).

Scholars consider what has been called "hard" versus "soft" environments. Hard environments refer to those physical attributes and spaces that are unresponsive and unyielding, resisting human imprint. Soft environments are flexible and responsive, characterized by warm colors, soft furniture, and textured floor coverings. Research has shown how each affects certain school dynamics, including student interaction and participation or school vandalism (Sommer & Olsen, 1980; Casserly, Bass, & Garrett, 1980).

Weinstein's (1979) extensive review of the research includes investigations of classroom design and furniture arrangements, seating arrangements, density and crowding, privacy, and the influence of open space designs. She recounted considerable evidence linking physical environment to what she termed "non-achievement behaviors and attitudes" (p. 598), with density and crowding resulting in dissatisfaction, decreased social interaction and increased aggression. "Soft classrooms" encouraged better attendance, greater participation and improved attitudes toward class, instructor and peers. As well, minor design modifications to existing classrooms produced changes in spatial behavior, increased engagement with instructional materials, decreased interruptions, and encouraged more high level questioning. Weinstein and Moore and Lackney (1993) join Weinstein in maintaining that these "pro-social behaviors" ultimately affect academic performance (p. 101).

Researchers have investigated the relationship between the physical structure and arrangement of the classroom, the teacher and students, and the distribution and utilization of classroom space (Gump, 1987; Rivlin & Rothenberg, 1976). More recently, intelligent classrooms have become a focus for study (Tiburcio & Finch, 2005). Intelligent classrooms

make extensive use of information computer technology (ICT); maintain flexibility as a central design feature, including the ability to utilize moveable, attractive and adjustable furniture. Evidence revealed significant increases in space flexibility and teacher mobility in the intelligent classrooms, with a tendency toward more child-centered instruction. The more mobile the teachers, the more interaction occurred with and between students. Further, furniture and equipment in intelligent classrooms were routinely rearranged and relocated, according to instructional needs and purposes.

As one final example, the effects of color, a complicated focus of study, has received considerable attention. Across a wide range of disciplines, researchers have considered how color affects mood, concentration, motivation, pleasure, and the perception of space. They have measured everything from blood pressure to rates of teacher burnout to student work habits and performance in order to identify correlations between these attitudes, perceptions, behaviors, and outcomes and color within the environment (Cohen & Trostle, 1990; Knirk, 1979; Ketcham, 1964; Ketchen, 1958, Thompson, 2003). Color preferences appear to be age sensitive, with younger children preferring bright, stimulating colors and adolescents favoring cool, relaxing hues. Evidence suggests that interior spaces, painted in complementary color combinations, have a positive effect on student behavior and performance (Ketcham, 1964).

Educational Outcomes

Even as some question the role facilities play in student achievement, a growing literature investigates the link between facility quality and student achievement and is reviewed elsewhere (Earthman, 2004; Earthman & Lemasters, 1996, 1998; Lemasters, 1997; Higgins, Hall, Wall, Woolner, & McCaughey, 2005; Schneider, 2002). Specific building features and conditions, relating to human comfort, have been shown to influence student achievement. These include

building age (Bowers and Burkett, 1998; Chan, 1979; Earthman & Lemasters, 1996; McGuffey & Brown, 1978; O'Neill, 2000; Phillips, 1997; Plumley 1978); non-modernized versus modernized and refurbished buildings (Maxwell, 1999; McGuffey & Brown, 1978; Plumley 1978); climate control and indoor air quality (Cash, 1993; Earthman, 2004; Hines, 1996; Lanham, 1999); lighting (Heschong Mahone Group, 1999; Kuller & Lindsten, 1992; Mayron, Ott, Nations, & Mayron, 1974; Wurtman, 1975); acoustical control (Evans and Maxwell, 1997 ; Haines, Stansfeld, Job, Berglund & Head, 2001; Hygge, Evans, & Bullinger, 2002; Maxwell & Evans, 2000); overall impression (Tanner, 2000); and design classifications including flexible classroom arrangements, clearly defined pathways, positive outdoor spaces, large-group meeting rooms, instructional neighborhoods, and ample egress (Tanner & Lackney, 2006). Although a study of the relationship of school building quality to student achievement in Wyoming found little correlation, the results may have been influenced by a restriction of range, as only 7% of the schools were rated as in need of immediate attention (Picus, Marion, Calvo, & Glenn, 2005). Studies that have applied expert assessments of building conditions and features and those that have relied on participants' subjective assessments have rendered comparable results (Berner, 1993; Branham, 2004; Buckley, Schneider, & Shang, 2004).

Students are not the only ones affected by poor quality buildings. The nature and quality of the built learning environment also has been shown to affect teacher attitudes, behaviors, and performance (Buckley, et al., 2004; Dawson & Parker, 1998; Lowe, 1990; Schneider, 2003). As well, the quality of the building influences the community's ongoing engagement with a school. Berner (1993) found that parent involvement was related to the condition of school buildings in Washington, D.C. Likewise, Hawkins and Overbaugh (1988) studied exemplary Japanese and

American schools finding increased learning in the schools designed to reflect community values. In these schools, cleanliness and care emerged as the most important factors.

We are beginning to understand how and when a school's physical environment reinforces the established goals of teaching and learning. All this said, important questions surrounding school facilities effects remain unanswered, including *how* school facilities enhance or detract from the learning process and what constitute mediating variables (Bosch, 2006). As a growing body of evidence establishes the linkages between discrete physical features of school facilities and student behavior, attitudes, and achievement, it is important to acknowledge that while some influences are clearly physiological, others are related to social factors. These social influences are generally reciprocal and interactive, and thus, somewhat more difficult to define and quantify (Lackney, 1996). These qualities of the built learning environment are what create feelings of ease and comfort or alternately, put inhabitants on edge (Uline & Tschannen-Moran, in press).

Researchers in the field of environmental psychology study this relationship between behavior and environment, with the physical environment in the foreground (Proshansky, Ittelson, & Rivlin, 1970; Proshansky & O'Hanlon, 1977). "The center of the environmental psychologist's concern is …the physical environment in all its complexity…matched by a concern with the individual or groups of individuals in all their complexity… [and the] role… human perception, thinking, motivation, learning and feeling" play in these human-environment interactions (Pronshansky, 1974, p. 542-543). To determine how various features and characteristics of the physical school environment affect the learning process, it may be appropriate, indeed necessary, to explore measures of cognition, perception, and orientation, of preference and appreciation (Uline, 2000).

As we have investigated discrete characteristics of the school environment, we have paid less attention to understanding how individuals construct meaning from these physical features and conditions. How do children and adults apprehend and appreciate familiar spaces and arrangements within the day-to-day environments they inhabit? What factors instigate particular preferences and how do these likes and dislikes shape choices and subsequent behaviors? How do experiences within these environments affect occupants' sense of self and their individual and collective identity? These responses and understandings likely affect individual and collective attitudes and behaviors, shaping a school's climate, and ultimately, the learning and performance of the occupants.

School Buildings as Primary Places for Development and Learning

Throughout our lives, we develop strong connections to the places where we grow up, live and work. Our emotional and cognitive conceptions of these physical environments inform our understandings of ourselves, both as individuals and members of social groups (Knez, 2005). Outside of the home, students spend the greatest portion of their time in school (Gump, 1978; Rivlin & Weinstein, 1995). Here they continue to develop a sense of self, a measure of their own competence, and an increased understanding of their ability to relate to peers and adults. "[School] is a place with meaning for children's images of themselves and for their image of learning the domains of ideas, facts, and other information". Given its primacy in their cognitive, social, and emotional development, "school as *place* [warrants close] attention as a physical entity and continuing experience in children's lives" (Rivlin & Weinstein, 1995, p. 252, 256, emphasis in original).

For several decades, scholars have studied children and adults' emotional and cognitive relationships to place (Hart, 1979; Tuan, 1977; Moore, 1986; Hay, 1998). Researchers employ

the term place "to foreground the meaning and/or emotional tie associated with physical environments" (Groat, 1995. p.2). Undifferentiated spaces become places as we come to understand and value them (Tuan, 1977). Seminal works by Relph (1976) and Canter (1977) define place as comprised of three interrelated components, including its features or appearance (the physical attributes), the observable activities and functions that occur within it (the actions), and the meanings or symbols people derive from a given place (the conceptions). We come to know a place as we identify its physical features and parameters, the behaviors to be housed within it, and the conceptions people hold of these actions within this particular physical setting.

Across the literature, place signifies an extensive construct (Canter, 1997) with physical, geographical, architectural, historical, religious, social and psychological connotations (Knez, 2005). Architects, humanistic geographers, psychologists and sociologists each add their own particular nuances to the definition of place. Still, researchers across disciplines appear to share the common assumption that through attachment to places "a person acquires a sense of belonging and purpose which gives meaning to his or her life" (Proshansky, Fabian, & Kaminoff, 1995, p. 90)

People-place Relationships

Key concepts in the literature on people-place relationships include a *sense of place*, defined as the experiential process created by the setting itself in combination with what a person brings to it (Buttimer, 1980; Tuan, 1980; Steele, 1981; Jorgensen & Stedman, 2001); *place attachment*, defined as people's bonds to particular places (Altman & Low, 1992; Hidalgo & Hernandez, 2001); and *place identity*, defined as the dimensions of self that develop in relation to the physical environment (Proshansky, 1978).

While empirical research has largely targeted residential settings and our attachment to them (Hay, 1998; Hidalgo & Hernandez, 2001; Jorgensen & Stedman, 2001), original definitions of place identity assumed interactions extending beyond home and its surroundings (Proshansky, Fabian, & Kaminoff, 1995). In fact, researchers have studied the neighborhood (Berg & Medrich, 1980; Taylor, 1996; Twigger-Ross & Uzell, 1996), natural and wilderness environments (Bricker, & Kerstetter, 2000; Owen, 1988; Steel, 2000), and public places (Low, 2000). Further, scholars underscore the dynamic nature of relationships to place as constantly evolving through the course of a lifetime (Chawla, 1992; Hay, 1998; Manzo, 2003; Twigger-Ross & Uzell, 1996). Such a dynamic view acknowledges positive as well as negative feelings associated with a broad range of physical settings (Fried, 2000; Manzo, 2003; McAndrew, 1998; van Andel, 1990).

An in-depth review of this expansive literature far exceeds the scope of this paper. Our particular interest in school as a primary place of meaning for children (as well as for other stakeholders) begs particular attention to notions of place identity. Related theory and research informs our understanding of how individuals come to know themselves in relation to the places they inhabit, in this case the school environment.

Place Identity

As stated earlier, place identity connotes those dimensions of self that develop in relation to the physical environment (Proshansky, 1978). Although we tend to emphasize the role social environment plays in the development of self, "the places a child grows up in, comes to know, prefer, seek out or avoid also contribute significantly to self-identity" (Proshansky, et al., 1995, p. 104). To the degree that certain places are familiar, useful, and malleable, these places help

children maintain a sense of self, including the definition of that self (Proshansky & Fabian, 1987).

Research suggests that adults consciously choose environments supportive and reflective of their sense of self. Where they experience incongruence, adults attempt to alter the setting or relocate (Twigger-Ross & Uzell, 1996). Studies of place preferences in children and adolescents provide similar evidence, with youth also favoring places that bolster self-esteem and nurture self-concept (Newell, 1997), including private, personalized, and natural settings (Rivlin, 1990; Owen, 1988; Sobel, 1990). When asked to describe favorite (important, liked, valued) places in their day-to-day surroundings, children and adolescents chose places that were relaxed, calm, and comfortable, "indicat[ing] that favorite places afford emotional release and restorative experiences" (Korpela, 2002, p. 366). Research suggests that adults and children use favorite places to regulate their responses to challenging and emotionally laden life experiences. These favorite places provide opportunities to reflect and gain perspective on the life's challenges (Korpela, 1992, 2002; Korpela, Hartig, Kaiser, & Fuhrer, 2001).

A dynamic relationship between a person and the physical environment exists within which the person shares in the creation of the environment, revealing the nature of self. In turn, the environment gives back to the person, thus reinforcing self-identity and perhaps changing the person in some way (Cooper as cited in Proshansky, et al., 1995). Attachments to important places, and their subsequent integration into a person's sense of self, continue through adulthood. Enduring memories of favorite childhood places inform immediate experiences, offering opportunities for creative self-development (Chawla, 1992).

Physical settings vary in their capacity to satisfy our needs and desires, and, thus, positively influence our perceptions of a given place and our relationship to it (Proshansky, et al.,

1995). From both good and bad experiences, emerge particular values, attitudes, feelings and beliefs about the particular physical settings we inhabit. Positive experiences foster skills of environmental understanding, competence and control, engendering a deeper sense of belonging. These experiences are by no means confined to childhood. When adults are immersed in a given place over long periods of time, they, too, gain skills in negotiating the setting and, in turn, attain their own sense of belonging within the setting. These feelings and understandings, in turn, support their sense of self as mature adults (Proshansky, et al., 1995).

Conversely, physical settings of home, school, and neighborhood that threaten, detract from, or interfere with the self-identity not only preclude belonging but may, in fact, produce aversions to a given place and the activities that happen within it (Proshansky, et al., 1995). Positive or negative cognitions depend in part upon the overall quality of the physical setting, and its more specific qualities, including, for example, human comfort, pleasing appearance, adequacy of space, functional furniture and equipment, a clean and orderly environment, and regular maintenance, all of which are necessary for human activity and social interaction.

And yet, a high quality physical environment, in and of itself, may not suffice. In fact, there is no physical environment that is not also a social environment and vice versa (Ittleson, Proshansky, Rivlen, & Winkel, 1974).

> The best and the finest physical settings measured in normative term may not be enough for developing [positive] cognitions of the setting. The quality of a physical setting is also a function of the quality of the social context of which it is a part, the latter including how well individuals play their roles, the nature of their feelings toward each other, the degree of conflict and frustration that arises,

> the extent to which social expectancies are met *(i.e. the climate of the place)* (Proshansky, et al., 1995, p. 106, emphasis added).

In order for school buildings to reach their full potential to produce cognitive and affective growth, it behooves us to consider this interplay between the physical environment, the social climate of the place, and the relationship of both to occupants' developing sense of themselves and their conceptions of the activities and behaviors contained therein. Close examination of this complex interplay may help us better leverage the physical environment of school on behalf of improved learning experiences and outcomes. In what ways does the meaning that participants make of their physical surroundings impact the seriousness with which students and teachers approach their work? How do specific structural and furniture arrangements impact the quantity and quality of the professional relationships between teachers, and those of students? And how do these arrangements impact connections between schools and the communities that support them?

Study Design and Methods

Further examining the ways in which school climate mediates the complicated interplay of factors may help to tell a compelling story about how human comfort, pleasing appearance, adequacy of space, functional furniture and equipment, a clean and orderly environment, and regular maintenance effects occupants' sense of well being and thus their capacity to teach and learn. The primary research question that directed this phase of inquiry was as follows: How do specific indicators of building quality (including human comfort, pleasing appearance, adequacy of space, functional furniture and equipment, a clean and orderly environment, and regular maintenance) support or impede a positive school climate, fostering occupants' relationship to the school as place, thus bolstering their capacity to teach and learn? Secondary questions

included: How have the specific indicators of building quality encouraged or discouraged a clear focus on academics and to what extent do the specific indicators of building quality engender in teachers a sense of enthusiasm for teaching? In what ways do occupants leverage the design qualities of new and renovated facilities on behalf of teaching and learning? In what ways do occupants compensate for the limitations of existing facilities in order to develop and nurture a positive school climate? And, to what extent do specific indicators of building quality encourage a collective identity as a community of learners that supports teaching and learning?

School Profiles

Structured according to a collective, instrumental case design (Stake, 1995), two schools from the original sample were purposefully selected, maximizing learning from cases rich in information (Stake, 1995; Patton, 1990). As a sampling strategy, we identified schools from among the population of middle schools that participated in the earlier study in which the faculty ratings of the facilities were in the top quartile of those surveyed and where more than 50% of the student population received free and reduced price meals. We narrowed the sample further by identifying one urban and one rural school that met these criteria. Thus, this small sample was not intended to represent the larger population of this state's middle schools. Instead, the research team employed balance and variety, further extending the opportunities to learn.

Alfred H. Dell Middle School. Situated in an historic city neighborhood and *s*urrounded by large, older homes, Dell Middle School is characterized by Spanish architecture, with a red tile roof that is echoed across the rooftops of several surrounding homes and buildings. The building is three stories high with the longest balustrade in the city creating a wide, welcoming terrace. Tile medallions surround the doorways with large and ornate columns to emphasize the entrance to the school. Exterior landscaping is the work of parents whose children learn here.

Approximately 30 percent of the school's population is bussed from a lower socio-economic neighborhood across the city, another 30 percent live in the neighborhood where the school is located, and the remainder elected to attend as part of a school choice initiative. 467 students in grades six through eight call Dell their school. The student population is primarily minority (85%) and two-thirds (66%) are eligible for free and reduced priced meals. Generally, students do well on state performance assessments with many students going to highly-selective high schools after their eighth grade year; many also go on to college after completing high school. According to the state accountability ratings, Dell has been fully accredited for the past four years.

Newcastle Middle School. Newcastle Middle School is situated on a road adjacent to a rural two-lane highway in the middle of a small town. Approximately 538 students in grades four through eight attend school here; most ride busses with routes that take them far into this rural area. As you approach Newcastle Middle School, the gabled roofline invites visitors and the marquee in front is frequently updated celebrating student achievements and announcing upcoming events. Originally, Newcastle was built as a high school with the wing now serving the sixth grade constructed in 1964. The school was later converted to serve as a middle school and was renovated in 1992. The auditorium in the school is a community focal point for school and community events. As visitors enter the school, they find a large lobby filled with park benches, plants, and display cases. Across the lobby, the school office is enclosed in large glass windows and sits as the hub of classrooms, library, and auditorium. As at Dell Middle School, Newcastle has also consistently received a fully accredited rating for the past four years, with all students generally achieving well on state performance tests, despite a student population that is 53% minority and with over half of the students (52%) who qualify for subsidized meals.

Data Collection

Researchers triangulated data by way of individual and focus group interviews, walkthroughs and student-generated photographic documentation conducted at each of the case study schools (Denzin, 1970; Merriam, 1988; Patton, 1990; Stake, 1995, Capello, 2005). Interviews with building principals, teachers, students, parents, and school custodians were conducted according to semi-structured questions about various features of the school building and how these characteristics and conditions support and/or impede communication, interaction, and learning among students, teachers, and parents. These semi-structured interview questions took advantage of the "codable nature" of pre-established categories (Fontana & Frey, 2000), while still encouraging a certain degree of open-ended response from participants. Interview protocols were similar across participant groups, acknowledging the need for some tailoring of questions in response to the roles, responsibilities, and experiences of various occupants, at the same time allowing for comparisons of responses across these groups. The school administrator and the school custodian represented two primary participants, along with a sample of teachers, students, and parents representing key building occupant groups. In order to gain a range of perspectives, teachers representing various grade levels and/or subject areas within each school, were recruited to participate in a focus group sit-down interview. Building principals recommended these teacher participants based on their involvement at different grade levels and/or in various subject areas within the school. An additional teacher participant engaged in a building walkthrough, for a total of 20 research participants at each school. All interviews took place at the school site.

Specialized Research Methodologies

In addition to the individual and focus group interviews, two specialized data collection methodologies were employed in this study: student-created photographs with subsequent debriefing and walking interviews. For the photo-documentation, we provided students with Polaroid cameras, asking them to document through the lens ways that their school building impacts their learning. Photography is often used in field research when the images are existing data rich with visual information that can be analyzed; however, photographs may also be useful tools in documenting and obtaining knowledge (Harper, 2005). "Photographs can be communication bridges between strangers that can become pathways into unfamiliar, unforeseen environments and subjects" (Collier & Collier, 1986, p. 99).

Following the photo documentation activity, researchers then invited the student photographers to group their pictures into categories of the students' choosing. Using an interview protocol, researchers asked students to describe why they chose to make the photographs they did and to describe why the subjects of the photographs do or do not contribute to the learning environment at the school (Cresswell, 1998). Using established "hall pass" procedures at the participating schools, students were supervised, but not directly accompanied by the researchers during the photography session in order to free the subjects from any preconceptions that might privilege that conception in the students' minds.

The walking interview provided opportunities to experience the school facility in the company of representative occupants, learning how they respond to the physical features and conditions of the school (Nelson, 2001). A student, parent, teacher and administrator were asked to take the researchers on a tour of the building and to share their perceptions and feelings, as well as how they make meaning in response to the symbols and arrangement of space. The tour began outside the building and asked participants to share the meanings they make of various

symbols they encounter as they approach the front entrance. Other meaningful places may have included display cases, communal gathering spaces such as the cafeteria, media center, commons, auditorium, gymnasium, classrooms, computer labs, etc. The interviews were structured so as to move through four phases in each location: objective, reflective, interpretation, and application (Kelehear, 2006).

Data Analysis

With respect to data management and analysis, all interviews were audio-taped and transcribed. Observations were hand written as field notes. Data analysis occurred continuously throughout data collection as the researcher attempts to identify emerging themes as well as tease out anomalies and contradictions (Holsti, 1969; Merriam, 1988). Some preliminary categories were generated from the literature and altered as additional themes and patterns emerge (Fook, 2002). The use of member checks, as well as the maintenance of an organized documentation system, helped establish the confirmability of research findings.

Preliminary Findings: The Personality of Space and the Identity of Occupants

Two very different middle schools within two significantly different contexts formed the basis for these case studies. What they have in common is a positive learning climate, positive building qualities, greater than 50% of the student population qualifying for subsidized meals, and high achievement rates. Of note is the recognition that occupants of both buildings found a sense of place and sense of community that contributed overall to both climate and achievement. Similar observations regarding how the facility was put in service of learning were found in the rural and urban buildings.

The ongoing interaction between the design and reality of the built environment and the occupants of that environment helped to define the climate of the place. Reciprocally, the climate

helped to shape the interactions that took place, fostering environmental understanding, competence and control and supporting academic learning. The result was a deeper sense of belonging within the setting. Students and teachers at both schools had a difficult thinking of school life elsewhere. Nicki, when asked if she would be a different person if she attended another school, stated, "I can't even imagine attending a different school." At Dell, students were well aware of the climate and condition of the buildings at other schools compared with their own, partly because many students had chosen to attend Dell rather than attend their neighborhood schools. One Dell student emphatically stated that she felt Dell students would not be the same, their identities as human beings and as students would be somehow altered, if they went to school in some other place. Likewise, a Newcastle teacher spoke up as the researchers left the school office at the end of the day, making certain we understood why she had taught there for almost three decades. For this teacher, there was no other place she could imagine working.

At both Dell and Newcastle, student informants had clearly formed identities as members of the school community. Significant to the many facets of adolescent identity, this attachment is often a balance of many roles adolescents adopt and a prime task of this age (e. g., Violand-Sanchez & Hainer-Violand, 2006; Carter, 2006). Situated within an individual's concept of identity are notions of culture and ethnicity, family and friends, interests and talents, and political, geographical, and historical relevance. Of interest here is identification as part of a school community and the role the school building plays in this aspect of identity formation.

One group of five students provided a photo tour of the building at Newcastle. While the students were aware of the researchers' interest in the building itself, no other directions were given. The tour started in the lobby area where students pointed out and photographed display

cases, national flags, and the benches the principal placed there to increase interaction. From there, the tour moved to the fourth-grade wing where students, unprompted, pointed out the student-created wall displays. Contrast a study from California (Staiger, 2005) where the school walls were literally described as a battleground with graffiti artists known as taggers claiming territory and school administrators asserting authority by marking, re-marking, or covering the walls. At Newcastle, the walls, instead, served the function of participation and shared authority at the school with student learning as the primary focus.

As the walking tour continued, students pointed out artwork they had created, charts that celebrated academic successes, and displays that captured other aspects of the students' identities, transcending school. These displays literally lined the walls of the back hall, formerly a difficult area for supervision. We observed that the administration had actually given the walls to the students; as a result, there was virtually no graffiti, vandalism, or litter in the hallways. During the photographic documentation, two different students photographed a teacher-created display of prominent African-Americans placed there to coincide with Black History Month. When the researcher asked Ivy if she learned about Martin Luther King or Rosa Parks from the posters she said "Yeah" but quickly added, "and also from the teachers." She connected the book her teacher had given her, the lesson presented, and the posters outside the classroom in another wing of the school. For Ivy and Tameka, the wall decorations also held meaning for them as African-American students, reflecting and celebrating facets of their racial identity.

Wall space near the auditorium was dedicated to a school project benefiting schools in a third-world nation. The artwork included a logo and slogan to remind students to "Reach Out" with construction paper cutouts shaped like hands featuring students' names. The hands were then taped at the top of the wall, near the ceiling, and the chain stretched around most of the

school's hallways. Here again, the students knew exactly where the hand bearing their names was located. Photographs of these hands and the central artwork appeared in four students' photos. The main hallway at Dell held pictures of graduating classes from the school throughout its history. One African-American student had an aunt who had been a student at Dell shortly after the school had become desegregated, and pointed with pride to her aunt's picture in one of those class pictures.

In every instance, the students had difficulty talking about the school building as separate from the learning activities and the relationships they experienced within it. Nicki commented about Dell Middle School, "Though it's old, you get a sense that someone cares….this one [school] was different…It's like shining lights coming out of it" and she finished with a little singsong chant. Noddings (1984) describes a caring relationship as a reciprocal relationship or shared experience. The idea that adolescents have a self who must be invested in the school community is also reflected in the built environment, its appearance, and the care that most stakeholders take for the built environment. These positive people-place relationships were found in both cases studied. Wallace Stegner (1992), novelist and historian wrote, "No place is a place until things that have happened in it are remembered in history, ballads, yarns, legends, or monuments" (p. 202). Nicki photographed the podium in the auditorium at Dell Middle School in preparation for her interview. She told us that the students' voices could always be heard at Dell and the podium represented the ideal that someone would listen. The yarns and legends Dell students tell about their concerns and experiences, as well as the monuments of student work at Newcastle, qualify both schools as *places* according to Stegner's definition.

Teachers, like students, create an identity that is situated within the work place of school. Gee (2004) uses Discourses with a capital D to differentiate it from language in use. Discourse with a capital D incorporates this notion of identity:

> It's almost as if you get a tool-kit full of specific devices (i. e., ways with words, deeds, thoughts, values, actions, interactions, objects, tools, and technologies) in terms of which you can enact a specific identity and engage in specific activities associated with that identity. (p. 124)

Buildings, as both object and technology, represent a means of creating a teacher identity that conveys values (Hughes, 2004) about space, learning, and community. School is a place where teachers work, but teachers may define themselves by the school place, too. At Dell, teachers talked about their individual development as teachers as part of the collective history of the place. According to one, "Many residents of our city celebrate its rich history. This building stands as a symbol of this history and we're a part of that." In fact, another teacher at Dell opened a closet door to reveal an early twentieth century kitchen unit in the teachers' lounge that was no longer serviceable but still a source of historical pride. The teachers at both schools clearly identified themselves as teachers who belonged in the community represented, in part, by the school building itself. Often, teachers who must travel from one room to another during the school day feel marginalized and perceive that the subjects they teach are not valued as highly. However, at Newcastle, one such itinerant teacher happily told researchers that the space she occupied for her instruction was truly shared space and not an imposition on the teacher whose room was not available during conference or planning periods as a result. Newcastle teachers felt grade-level team neighborhoods supported this sense of cohesion and team identity. At each

school, teachers and other adults took part of their identity from the school building, at the same time, contributing to the personality of spaces.

A number of themes emerged in the stories that occupants at both buildings told concerning their notions of quality and the ways that their school buildings either facilitated or posed obstacles to the central mission of teaching and learning. These are discussed in the next section.

Themes Related to Building Quality

From the data, several broad themes related to building quality emerged as central to this interaction between the built environment and building occupants, including movement, aesthetics, play of light, flexible and responsive classrooms, and elbow room. Although described separately, we acknowledge that the themes are overlapping and interrelated.

Movement

A clear sense of entrance and circulation influences the educational function of a building (Castaldi, 1994). When students sense an internal logic to the space and the paths of movement, they feel safe and at ease. Recall Amy's relief on the first day of school when she easily found her way to her classroom, realizing that the transition to this middle school would be manageable.

Thresholds. Thresholds are spaces of significant transition where expectations are heightened, mental models shift from place of origin to destination, and the mind prepares for the upcoming experiences, interaction, and tasks (Eberhard, Sandler, Canaves, Uline, Ulrich, Williams, & Mc Kellar, 2005). The specific features of key thresholds at both schools appeared to provide occupants a sense of welcome, anticipation, and wellbeing.

An open commons area, inside Newcastle's main entrance and adjacent to the auditorium, has become a focal point for the school community. When the current principal first arrived, the commons was a sterile environment devoid of furnishings. Fights often erupted here. Subsequently, students were prevented from using the area anytime during the school day, and instead, changed classes through the back hall where supervision and space were much more limited. To change the negative dynamic previously associated with the front lobby, Mr. Kelly added benches and potted plants. He welcomed in students who arrived at school early to wait inside and to converse with one another, as long as they behaved themselves. In view of the office staff who could observe the lobby through large windows, students began sitting on the benches and chatting, often across age and grade levels. The commons became a gathering place at all times of the day, as parents also used this space when they came to volunteer or attend events. Trophy cases were also a new innovation Mr. Kelly added as the school began to win musical and athletic prizes, assembling them himself on the weekend. During the photo tour interviews, students pointed out with pride to these glass-front cases with no locks. There were scarcely even fingerprints visible on them.

At Dell, the entry is much smaller but equally important. Parents described the expansive outside terrace as an important gathering place. Once inside, the central lobby includes thresholds to the library on one side and the main office on the other. Teachers, parents, and students spoke about the library as an important place for learning and the office as the hub, both aptly placed in this central location.

In student-made photographs, classroom doors appeared frequently. In each photo, the door was decorated in some important way. The transoms above the doors at Dell often included artwork and three-dimensional displays that somehow represented the teacher and students who

occupied the room. At both schools, but especially at Newcastle, the doors and spaces around the doors were used as extensions of the learning space. Content-area posters and student-created artwork, related to topics studied in that particular classroom, were prominently displayed. Outside the eighth grade social studies classroom, Claire pointed out the political cartoon she had drawn to accompany a unit on early American history. On walking tours and in photographs, the students featured the people and events connected to each classroom. They appeared unable to think of the classroom spaces separate from the human activities that occurred behind these doors.

Pathways. Design solutions should avoid mixed signals, applying visual clues where possible. The principal at Newcastle shared the mental map he provides incoming students fearful of getting lost in their new school. Says Kelly, "Don't worry, I'll show you; it's just a big a square." He also shared his description of the color scheme assigned to each grade-level wing, with color-coded lockers and trim that helped students know where they were. In turn, students acknowledged the care taken to create this means of wayfinding. For them it appeared to represent an invitation of sorts.

A parent at Dell described her daughter's response to the school's straight hallways where each grade-level team's classrooms were situated in close proximity to one another. Unlike the other monolithic middle schools she had visited in the district, her daughter found Dell "homelike." In particular, she mentioned the staircases with broad landings between floors. As a frequent volunteer at the school, this parent observed that this design feature helped to manage traffic flow, allowing students to move along at a reasonable pace to common destinations.

Aesthetics

At its most fundamental, the aesthetic pertains to a sense of beauty and concerns human emotion and sensations. Aesthetic experiences give us pause. They unify. Adults who work in schools benefit from an environment that takes account of such experiences, and this is no less true for the students who come to learn. When colors, shapes, and light allow for variety and surprise, children respond with excitement, curiosity, and determination (Uline, 1997).

***Signature features*.** Both schools boasted particular features to which occupants felt special attachment. A Dell parent talked about the "magic" of the place and how the combination of architectural features sparked curiosity and imagination. From the red tile roof to rod iron gates and trim, to ceramic medallions, the Spanish architecture introduced students to forms and ideas outside the range of their more typical experiences. She elaborated, "It's tactile. You want to reach out and touch it, explore the surfaces with your hands." One Dell teacher, Mrs. Reynolds, came to work in her classroom one Saturday when a construction crew was using a cherry-picker truck to complete window repairs. She asked if they would lift her to the level of the blue medallions that adorn the façade of the building. She then photographed a number of the tiles and created refrigerator magnets of the images to give as gifts.

In both schools, the auditoriums were particular sources of pride. Building occupants at Dell placed a high value on the tall windows and crown moldings as signature design features of their auditorium. When the original acoustical ceiling tiles loosened posing a safety hazard, the installation of a drop ceiling was posed as the most cost-effective solution to the problem. Instead, the PTA and the community raised the additional funds necessary to have the old tiles removed and replaced with an alternate material. A subsequent lesson on the value and effectiveness of the acoustical tiles emerged, however, when their absence created an unacceptable reverberation of sound in the room. Yet a second round of fundraising was initiated

to place large acoustical panels on the walls of the room, still preserving the original beauty of the windows and molding. At Newcastle, the auditorium was the site of community cultural events. Participants were proud of the quality of musical and theatrical performances they had been able to host in the community due to the availability of a high quality auditorium.

Pleasing appearance. Outdoor spaces and landscaping were noted for both their presence and absence across the two schools. At Newcastle, Claire's photo image of the playground captured outdated equipment in disrepair (a situation Mrs. Bends, assistant principal, told us would be remedied soon). Newcastle students also commented on how the interior courtyard was in need of maintenance and landscaping. At Dell, parents planted flowers and shrubbery at either side of the front entrance, adding even more color and texture to the outside spaces. Similarly, flower and vegetable gardens, maintained by Newcastle students, adorn the school site and provide opportunities to learn about plant life.

Because Dell is an older school, it also contains older furniture, but the students indicated a preference for the older furniture, often made of wood. They told the researchers that the old wood chairs had lasted for a long time, had been cared for, and were more comfortable than the newer plastic furniture found in many school buildings. Perhaps the warmth of the wood captured their attention, too. The podium Nicki photographed, the desk and computer table Daniel captured, and the auditorium seats and computer desks that Kylia caught on film were all made of wood. Similarly, teachers noted the oak millwork and made use of the doorways and moveable transoms over the doors to create a space that at once provided a visual identity for each door to a teacher's room and invited students to join in the community of learners who gathered there.

Play of Light

Windows and views, as well as various forms of light, have been linked to behavior and learning (Heschong Mahone Group, 1999; Kuller & Lindsten, 1992; Mayron, Ott, Nations, & Mayron, 1974; Wurtman, 1975). Daylight offers a more positive effect on student outcomes than other forms of lighting, potentially due to its biological effects on the human body (Heschong Mahone Group, 1999; Wurtman, 1975). Views to the outside provide necessary visual rest and relief (Kuller & Lindsten, 1992).

Windows and views. The abundance of natural light was highly prized at both Dell and Newcastle. At Dell, the light streamed through windows that stretched to the crown of twelve-foot ceilings. Every classroom was awash in sunlight. Mrs. Reynolds, a creative and engaging sixth-grade teacher at Dell, left to teach in a suburban school the year before; but she returned after just a single year away. Her suburban classroom lacked windows. She had returned, she said, because she missed the sense of community at Dell, but also because she missed those tall, beautiful windows. She commented, "It can be drafty next to the windows in the wintertime, but they are worth it!"

At Newcastle, teachers also commented on how they cherished the natural light from their windows. The classrooms at Newcastle were arranged around an interior courtyard so that almost all of the classrooms had windows to let in natural light. Mr. Kelly, the principal, noted that there was only one regular classroom at Newcastle that lacked windows, adding in a conspiratorial whisper, "We only put new teachers in there." In this comment, he acknowledged that being deprived of natural light was associated with low status and that once a teacher had accrued some stature; he or she would be moved to a room with windows. It should be noted that Mr. Kelly's story highlights researchers' concerns about the possible assignment of experienced teachers who are "more motivated or alert or responsive to students" to daylight-rich classrooms,

introducing a potentially confounding variable to the study of the relationships between natural light and learning (Heschong Mahone Group, 1999, p. 58).

It was evident that attention to natural light played into the plans when Newcastle was renovated 15 years earlier. Three large skylights were added, each at the intersection where a grade-level wing diverged from the main hallway. The trim on these lights was painted using the same color scheme as the lockers and trim in each of the wings, signaling one's presence in the sixth, seventh, or eighth grade wing. These skylights were one of the important features that eighth-grade Claire captured in her photographs, giving them the label "Abstract." The design of the renovation also evidenced a valuing of natural light in the art room. Although the art room occupied an interior space with no windows, the roof had been raised about four feet at one end of the room to allow daylight into one end of the classroom. Claire presented a photograph of a hallway without a skylight in an older section of the building; she labeled this hallway as "Dismal."

Lighting. When Dell was renovated a few years prior to the time of the study, adding central air conditioning and wiring for technology, decisions were made about how best to accommodate the necessary ductwork and conduit. Although it was more costly, the decision was made to preserve the high ceilings and windows in the classrooms and to limit the installation of drop ceiling to the hallways and cafeteria. In these two areas, antiquated light fixtures were replaced with florescent panels, brightening these formerly dim areas. Mr. Stickel, a shop teacher who had taught at Dell for sixteen years, noted that with the old lighting, students at a distance in the hallways could be seen only in silhouette, making it harder to identify students who might be misbehaving. With the new lighting, he said that students could be clearly

seen the length of the hallway; and it was his perception that behavior in the hallways had improved as a result.

Flexible and Responsive classrooms.

In addition to the value teachers, students, and principals placed on natural light, teachers appreciated the ability to open windows to allow the circulation of fresh air. Heschong Mahone Group (1999) found that students in classrooms where windows could be opened progressed seven to eight percent faster than those with fixed windows. Teachers at both Newcastle and Dell discussed how much they valued the ability to open windows. Even on the sunny but brisk February day when data collection for this study took place, one Newcastle classroom overlooking the dormant flower and vegetable gardens maintained by the students had the windows ajar to allow in some air.

Control. Teachers at Newcastle also appreciated having individual climate controls in their classrooms. Mrs. McCall noted that the teacher she teamed with liked the temperature to be three or four degrees cooler than she tended to like it. Individual telephones were a relatively recent addition at Newcastle, providing opportunity for more efficient and immediate communication within the building, as well as regular and immediate contact with parents. Mrs. McCall commented that the addition of the telephones had reduced the sense of isolation among the teachers and had allowed for greater collaboration with parents. She also pointed out the little black button on the intercom system that teachers could push if they needed the immediate assistance of another adult. This too, she noted, helped teachers to feel less isolated in their work.

Blinds were another feature that teachers appreciated, in order to adapt to changing conditions of light, weather, or distractions. As much as the teachers at Dell loved the natural light, they commented on the need for blinds to control the glare at different times of the day and

year. One Newcastle teacher, whose classroom overlooked the playing field also noted the importance of having blinds she could close when other classes had physical education on the adjacent fields or when exciting weather events, such as the first snowfall, became too much of a distraction from the lessons at hand.

Arrangement. Teachers seemed to value having the flexibility to arrange the space in their classrooms to various purposes. Custodians at both schools reported frequent requests to retain seating changes, reporting, "They switch it up often, depending upon the activity." Daniel, at Dell, used functional descriptions to categorize many of the photographs he took. Images he made included lockers and a desk with a rack for books used for "keeping stuff in" and a trashcan used for "getting rid of something." He also photographed a table used as a computer station and a chair that fell in his category of "somewhere to sit."

Mr. Stickel, the technology and shop teacher at Dell, had an unconventional classroom, in which three classrooms had been blended into one. The space of two of the classrooms was arranged into a shop area with large durable tables and both hand and power tools readily at hand; the third space was a computer lab. He taught a blended curriculum covering four systems: technology, communication, transportation, and manufacturing, with a research component that took place in the computer section and a hands-on component that the shop made possible.

At Newcastle, Mrs. McCall reported that her current classroom was the largest she'd had in her long teaching career. Her classroom had a tidy, uncluttered feel. The walls were covered with a bright array of posters and learning aids. A mural of the Virginia state flower and bird adorned the space above the white board at one end of the room. Mrs. McCall pointed out the valences she had put up above the windows to give the room a homey feel. When asked about these, she offered her perception that the students behaved better when the environment felt

warm and welcoming, and that she intentionally tried to soften what might otherwise be a more institutional or impersonal feel. These window valences were common in both schools, with the PTA providing them for all the windows at Dell.

Mrs. McCall pointed out the three literature discussion areas she had been able to include in her classroom as a result of the space available. Through the strategic placement of bookcases and spaces furnished with a collection of large pillows, Mrs. McCall had created three literature circles. She reported that she could have three groups of students simultaneously discussing three different books. She noted how her students loved to nestle into these cozy enclaves, and how she thought that this contributed to positive feelings about reading.

Design features that make for flexible and responsive classroom environments create a sense of comfort and invite occupants to actively experience school life. When students feel comfortable to move within and beyond their individual classrooms, chances are they will engage more actively in their own, and each others, learning (Uline & Tshannen-Moran, in press).

Elbow Room

Both schools boasted relatively small student populations. According to a state education website, Dell had 467 students with 28 teachers, a ratio of 1:17. Newcastle began the year with 538 students and 51 teachers, a ratio of 1:11. The researchers didn't observe crowding in any classrooms. Chaney and Lewis (2007) indicate that wear and tear and negative effects on classroom environment are potential results of over enrollment, defined as a condition caused by actual enrollment exceeding design specifications. Neither of the case study schools could be described as over enrolled, and neither of the schools made use of portable classrooms.

While the cubic footage afforded by the high ceilings at Dell gave the impression of spaciousness and reduced the sense of crowding, one teacher in a focus group at Dell did note the challenge of contending with the very real limitation of the square footage. With the number of students assigned to her room, she was concerned about the lack of flexibility the limited floor space provided. In contrast, the students at both schools felt that there was ample room in classrooms to move about without bumping into each other. Researchers asked students at both schools whether the furniture created or added to a sense of overcrowding; not one student answered affirmatively. In fact, most students responded with a somewhat puzzled look.

Students and teachers at Dell made extensive use of the common areas the older building afforded. After school students were found practicing for drama club tryouts on one staircase, and a drill team practiced on the landing between the first and second levels of yet another staircase, even though the gymnasium appeared to be available. Students at Newcastle also seemed to be aware of the spaces that were not in use, but potentially might be improved. Claire made three photographs from her set of ten that represented unused spaces at the school. These included a home economics kitchen, a playground, and a center courtyard.

Social areas and quiet areas for contemplation. One group of photographs Amy created was comprised of three images she called "Friends Time." The first image is the school cafeteria, the second is a classroom, and the third is a girls' restroom. When we questioned her about why this photograph fit in the category of friends' time, she explained that it was a place where she and her friends could gather to talk without interference from adults. Daniel and Nicki talked about the need for social space illustrating this with images they took of the cafeteria, a place where social activity might occur. However, Nicki also told us she liked to find quiet places to think or read. She was able to find such spaces in the gymnasium and on the school stage,

apparently at times when these facilities were not in use. Cafeterias at both schools were small enough to be socially intimate. Three students photographed the cafeteria at Newcastle and described the social life of that space as they talked about their images.

Egress. At Dell and at Newcastle, students entered and exited through different doors in order to manage traffic. Sufficient egress allowed freedom of movement into and out of the cafeteria. According to the custodian at Dell, "Traffic at lunch is never an issue, so students have plenty time to eat and socialize. Then they move back to class calmly, for the most part." Avoiding highdensity conditions in this manner limits excess stimulation, stress, and arousal (Wohlwill & van Vliet, 1985). The nature of traffic flow through a school building may make a significant difference in school climate. When physical surroundings force the occupants of a school to move against each other in crowded spaces, adults and students are more likely to violate personal space and put each other on edge. On the other hand, well-designed hallways allow passersby to move about comfortably (Tanner & Lackney, 2006).

Discussion and Implications

Models are idealizations of complex structures; as such, a model may emphasize some aspects of the target structure and minimize or even ignore others. In the remainder of this paper, we propose a model of interaction between the design and reality of a built environment (school buildings, in this case) and the occupants of that environment (students, parents, teachers, principals, custodians, and the larger community). The two-part model we propose suggests a personality of space that is particular to the structure. The particular personality of various spaces within a school may encourage a sense of belonging and foster a collective commitment to share learning goals. Personality of space may be viewed as the amalgam of the various attributes of the space; these include changes to the building over time, historical events,

affect of the people who inhabit and modify the space, the organization of the space as designed, and so on. de Botton (2006) reminds us that buildings and furnishings potentially evoke happiness in their occupants. To this, we add that school buildings and furnishings evoke not only happiness but also the desire to learn and participate in a learning community. The self-identities individual occupants construct result, in part, from the built environment, which in turn was created by past occupants, designers, community supporters, whose previous interactions continue to influence learning over the life of the building. Learning and schooling fill social needs; school buildings and furnishings both represent that need and contribute to it.

Our preliminary findings suggest that inhabitants did indeed influence the school place they occupied; at the same time, the school place influenced and shaped the identities of the human occupants, individually and collectively (Cooper as cited in Proshansky, et al, 1995). In both cases we studied, research participants described the ways in which the built environment facilitated daily activities and interactions. They also recalled circumstances that moved them to confront existing problems and/or acknowledge missed opportunities. Teachers, leaders, parents, custodians actively challenged existing spatial routines through re-conceptions of classroom arrangements, enhancements to entryways, changes in paths of movement through the building, and modifications in cafeteria seating and lighting, to name a few. Although various aspects of the built environment might have introduced constraints on learning, the occupants and important stakeholders made significant choices about the spaces within the building, the results of which contributed to improved learning.

While the design can be inflexible at some levels; in other ways, occupants are more comfortable when they control elements of the environment. We postulate that the degree of control occupants of the facility might exert over the built environment contribute to the school

climate. Brand (1994) suggests that changes to the built environment can be characterized as layers that are increasingly difficult to control. The topmost layer, the site, is the geographical setting and is almost impermeable to change. The structure itself and external features (known as the skin) are potentially malleable. The services layer includes heating and air conditioning (HVAC), wiring and so on. The services layer is not typically within the control of occupants, but control over such elements as temperature settings and window openings potentially contribute to perceptions of school climate. The space plan layer, which includes walls, ceilings, and wiring, and stuff layer, which include furnishings and accessories are potentially the most changeable and accessible layers occupants might control. Notably, the artifacts most often featured by students, such as artwork on the walls, represent the lowest of Brand's (1994) shearing layers, those things that potentially could be changed and were within the control of the building occupants.

Design features that allowed occupants flexibility in the use of space were highly prized in the schools we examined. As school designers balance considerations of durability with flexibility, the voices of these occupants may serve to argue for the inclusion of design features that allow occupants some measure of control over comfort and use factors. Just as usability logic has found its way into software design, school architects increasingly create adaptable systems with regard to light, temperature, and physical arrangements. School leaders may not just allow, but encourage, occupants to exercise control in personalizing their spaces through classroom layouts furnishings and decoration to generate a greater sense of identification and ownership, cultivating the pride of place. Furnishings are among the elements that can be most readily moved about and made to accommodate or impede human activity that occupants directly

control (Brand, 1994). Students, too, desire a sense of control in their school buildings, the ability to move about without feeling fenced in, and to have places to gather socially.

School designs that facilitate students' independent navigation within the building foster feelings of safety and confidence. When students can "read" a school building, they feel independent and self-assured. Further, acquired skills in environmental understanding, competence and control serve the larger goals of academic learning. Designs that incorporate familiar landmarks in the form of color codes, symbols, and familiar images, serve to assist children in acquiring these skills. Likewise, adults can encourage more experienced building users to assist new occupants in learning these spatial cues and patterns of movement. Such peer teaching benefits both the novice and experienced occupants.

The buildings we studied were places of pride within the communities they served. Each stood as a repository of the history of people who had worked and learned there. The colors, shapes, textures, and unique features of each school added to its aesthetic, engaging occupants and engendering in them a sense of affinity to the school as a place of learning. This pride of place served the educational mission of these schools, strengthening bonds of connection between the participants and facilitating and celebrating the important work contained within their walls.

Together, school architects and educators must work to elevate the significance of school as place, demonstrating how the physical elements of a school building define, organize, and reinforce the perceptual and conceptual order of school (Uline, 1997). To better prepare individuals for these roles, university programs might engage preparing teachers in an ongoing process of describing specific learning activities in terms of physical features and spatial requirements as a way to develop keener understandings of the degree to which physical

environments respond to individual learner needs and the manner in which learning happens within space, takes up space, utilizes or fails to utilize space. Likewise, leadership preparation programs should move beyond general discussions of building maintenance and operations to consider school planning, design, and construction as tools of investigation and a means to articulate and advance educational purposes. School leaders must prepare themselves to speak on behalf of these matters with authority and enthusiasm for the full range of possibilities. As designers involve themselves with educators, they have opportunity to enrich the vocabulary and further open the discourse, at the same time enriching their own knowledge of educational aims.

Conclusion

The results of this study reinforce findings from earlier research on the interaction between the built environment and the occupants of that environment, as well as on the relationship between building quality and student behavior and learning. The broad themes related to building quality that emerged from the data, including movement, aesthetics, play of light, flexible and responsive classrooms, and elbow room, echo findings from across this growing literature. Through the stories told by occupants of these two schools, we gain further understanding of the mechanisms of these interactions and relationships, learning more about how certain building conditions and design features helped to foster a sense of belonging within a place, a sense of control and competence within a place, and a sense of collective commitment to the place and its purposes.

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