ABSTRACT: This study explored the interplay between quality facilities and school climate, charting the effects of facility conditions on student and teacher attitudes, behaviors, and performance within schools slated for renovations in a large metropolitan school district. The research applied a school leadership–building design model\([Q1]\) to explore how six characteristics of facility quality—movement, aesthetics, play of light, flexible and responsive classrooms, elbow room, and security—interact with four aspects of school climate: academic press, community engagement, teacher professionalism, and collegial leadership. Because the schools were older and participants in the research perceived them as being in great need of maintenance and repair, the school building characteristics were often described as absent qualities. The survey data revealed moderate to strong relationships between the quality of school facilities and school climate. The interviews further explicated these relationships. Two additional themes—counterbalance and equity—emerged as being significant to occupants’ interactions with their current facilities. This study used a mixed-methods triangulation design–data transformation model. Specifically, school climate surveys, photo interviews with students, walking tours of the school facility, and formal interviews were triangulated to obtain complementary data and a more complete understanding of the educational facility to be renovated and its impact on occupants.

Students, teachers, parents, and community members initially come to understand the primary functions of school through their observations of the buildings and grounds. Occupants struggle to perceive a clear focus...
on academics when the facility is architecturally substandard or poorly maintained. Under such circumstances, the learning environment is less likely to be conceived as being worth its occupants’ attention. Teachers may not demonstrate enthusiasm for their jobs and a willingness to exceed minimum standards in support of student learning. When the buildings are in disrepair or appear dilapidated, the community is less likely to engage in activities supportive of the school’s mission (Uline & Tschannen-Moran, 2008). In fact, recent research suggests that such physical disorder and neglect are significantly related to a climate of social disorder within schools; that is, these conditions can invoke fear among students and erode a school’s sense of collective efficacy (Plank, Bradshaw, & Young, 2009). This study builds on earlier related studies. Here, we continue to explore the interplay between quality facilities and school climate, now charting the effects of facility conditions on student and teacher attitudes, behaviors, and performance within schools slated for major renovations in a large metropolitan school district.

SCHOOL PHYSICAL ENVIRONMENT AND STUDENT ACHIEVEMENT

A growing body of research has connected the quality of school facilities to student outcomes, including achievement and attitude, as well as teacher attitude and behavior (e.g., Earthman, 2004; Earthman & Lemasters, 1996, 1998; Lemasters, 1997; Schneider, 2003). Specific building features and conditions have been shown to influence student achievement, including climate control and indoor air quality (Cash, 1993; Earthman, 2004; Lanham, 1999); lighting (Heschong Mahone Group, 1999; Wurtman, 1975), acoustical control (Evans & Maxwell, 1997; Maxwell & Evans, 2000), building age (Bowers & Burkett, 1998; Earthman & Lemasters, 1996; Plumley, 1978), nonmodernized versus modernized and refurbished buildings (e.g., Maxwell, 1999), and overall impression (Tanner, 2000). In addition, design classifications have been found to influence student outcomes, including flexible classroom arrangements, movement and circulation, positive outdoor spaces, large-group meeting rooms, instructional neighborhoods, ample egress, and views (e.g., Tanner, 2009; Tanner & Lackney, 2006). Where researchers applied measures of facility quality that account for the educational purposes of schools, experts’ appraisals and occupants’ subjective assessment results were comparable (Roberts, 2009).

Students are not the only ones affected by poor-quality buildings. The nature and quality of the built learning environment has been shown
Improving the Physical and Social Environment of School

[Q3: Please include Earthman & Lemas- ter, 2009 in list.]

Q3: Please include Earthman & Lemas- ter, 2009 in list.

to affect the community’s ongoing engagement with a school (Berner, 1993), as well as the teachers’ attitudes, behaviors, performance (Buckley, Schneider, & Shang., 2004; Dawson & Parker, 1998; Earthman & Lemas- ter, 2009; Lowe, 1990; Schneider, 2003), [Q3] and choices about where to work (e.g., Fuller et al., 2009). Research suggests that new elementary schools in Los Angeles attract younger, more recently trained members of the teaching ranks (Fuller et al., 2009). Horng (2009) surveyed 531 California elementary teachers, asking them to choose among various workplace characteristics. She employed a conjoint analysis methodology, asking teachers to trade off student demographics, salaries, and working conditions, including school facilities, administrative support, class sizes, and salaries. In response to earlier studies suggesting that teachers avoid schools with significant populations of low-income, minority, and low-performing students, Horng sought to “disentangle student characteristics from other characteristics of teaching jobs” (p. 690). She was interested to know if student characteristics serve as proxies for the working conditions common in schools that are attended by low-income, minority and low-performing students. In fact, data from this study suggest that when teachers choose among schools, on average, the condition of the school facility is more than twice as important as student demographic variables and 30% more important than salary.

Even as evidence mounts, school leaders—particularly, those in poorly resourced districts—struggle to convince policymakers and taxpayers of the need to invest resources in replacing or renovating inadequate school facilities. A recent national report conducted by Building Education Success Together (2006) described public school construction over a 10-year period in the United States, including the scale, scope, and distribution of recent school facility investments nationwide. Data revealed that students in poorly resourced districts received much smaller shares of the overall expenditure on adequate facilities. Likewise, a study that calculated capital stock and unmet capital investment requirements of districts in Michigan indicated that underresourced districts continued to have the greatest need (Arsen & Davis, 2006). Together these studies help to refine and focus earlier estimates of need, confirming that many of the most challenged school districts continue getting by with poor-quality buildings (Mead, 2005, p. 1). It appears many remain unimpressed with the seriousness of the problem, challenging the relative impact of capital investments on student achievement when compared with other factors that demand the attention of policymakers, administrators, teachers, and members of the community. In fact, recent empirical evidence suggests that such either/or decisions about where best to invest resources may be shortsighted (Crampton, 2009).
Whereas investigation of the discrete characteristics of the school’s physical environment has been helpful, researchers have paid less attention to the ways in which individuals construct meaning from a school’s physical features and conditions. 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. Deeper understandings of the 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 for the importance of maintaining a high-quality educational infrastructure.

SCHOOL SOCIAL ENVIRONMENT AND STUDENT ACHIEVEMENT

Assessments of school climate have described social dynamics in schools, and research spanning nearly 50 years has established the link between these dynamics and student achievement (e.g., Anderson, 1982). In this study, we investigated four aspects of school climate: academic press, community engagement, teacher professionalism, and collegial leadership. Academic press is the degree to which a school reflects a serious and orderly learning environment where teachers set high goals and students respond positively and work hard to achieve these goals. Research results have repeatedly demonstrated strong relationships between academic press and student achievement (Hoy, Hannum, & Tschannen-Moran, 1998). Community engagement is the capacity of a school to draw on and constructively interact with its larger community. This concept describes the extent to which the school can count on involvement and support from parents and community members and the extent to which the school engages the community in its achievements. A school’s capability to engage the community in a productive manner was found to be related to student achievement (DiPaola & Tschannen-Moran, 2005; Tschannen-Moran, Parish, & DiPaola, 2006). The construct of teacher professionalism captures teachers’ perceptions of the extent to which their colleagues demonstrate commitment to the student occupants of the school, engage in the teaching process, and willingly cooperate with one another. Teacher professionalism, like earlier measures of teachers’ attitudes, has been linked to student achievement (e.g., Hoy et al., 1998). Finally, collegial leadership reflects the perceptions of the faculty that the principal is friendly and approachable and takes the perspectives of teachers into account when making de-
cisions. Collegial leadership has not been consistently found to be related to student achievement, reflecting the indirect relationship of principal leadership on student learning (Tschannen-Moran et al., 2006).

**BACKGROUND**

The current study constitutes the third phase of an ongoing research study titled “The Walls Speak.” The study examined the proposition that at least part of the explanation for the link between school building quality and student outcomes may be the mediating influence of school climate. Phase 1 of “The Walls Speak” focused on 82 middle schools in one mid-Atlantic state. It studied school climate, the quality of the school facilities and their maintenance, and the impact of both on student achievement (Uline & Tschannen-Moran, 2008). The results of that study reaffirmed the link between quality of school facilities and student achievement in English and mathematics. Correlation analyses indicated that quality facilities were significantly and positively related to three of the four school climate variables: academic press, teacher professionalism, and community engagement. The quality of facilities was uncorrelated to the proportion of students receiving free and reduced-price meals. However, the quality of facilities was strongly related to teachers’ ratings of the availability of resources for needed for instruction. School climate mediated the effect of school building quality on student achievement and suggested that some design features and building improvements leverage stronger results than others. To facilitate learning, the facility must be designed such that occupants feel comfortable enough to take the individual and collective risks necessary for meaningful interaction and learning.

To further explore the intricacies and nuances of how a school building's physical properties influence teaching and learning, researchers (Uline, Tschannen-Moran, & Wolsey, 2009) continued “The Walls Speak” with Phase 2 research, following a collective instrumental case design (Stake, 1995). Schools were identified from among the population of middle schools that participated in Phase 1 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. From the larger sample, researchers identified one urban school and one rural school that met these criteria. This strategy permitted them to explore the nuances of how high-quality facilities may help foster positive school climate and high levels of student achievement in schools that serve primarily socioeconomically disadvantaged student populations.
Findings of this research indicated that interactions between the building design and the building’s occupants helped to define the learning climate of these schools. Even as the school’s design influenced the occupants, the occupants changed various aspects of the school buildings over time. The flexible building design, combined with facilitative leadership, invited occupants to modify the physical environment to better meet their needs. This occupant–design interaction helped to foster students’ and teachers’ environmental understanding, competence, and control. The ongoing dynamic bolstered a positive school climate and supported academic learning. Several broad themes related to building quality and school climate emerged as being central to this interaction between the built environment and the building occupants, including movement, aesthetics, play of light, flexible and responsive classrooms, elbow room, and security. Furthermore, how school leaders envisioned and used the school spaces constituted a critical attribute. The schools in this case study demonstrated the important interaction between school leadership and building design. Where the spaces were flexible enough to permit leaders and teachers to make good use of the space, occupants were more likely to construct a positive identity for the places in their minds, individually and as a community. We advanced a school leadership–building design model as a means to describe this dynamic interaction (Figure 1).

Because the themes are complex and interlocking, we employed an arch metaphor to describe them and to capture the interaction between school climate and school leadership with building design:

In the arch metaphor, community and a sense of local history are the keystone on which all else rests. A semi-circular stone arch also consists of pillars and wedge-shaped stones that use compressive force, keeping the structure intact. The leadership-school design arch is built on pillars of school design and the influence of the occupants on the one hand, and the interaction of the occupant’s identity and the personality of space on the other. Over this, six themes provide the interlocking characteristics of facility quality: movement, aesthetics, flexible and responsive learning spaces, the play of light, elbow room, and a sense of safety and security. Entering the span, or opening, the school’s climate (academic press, teacher professionalism, and community engagement) interacts with all these characteristics of facility quality, mediating their combined influence on student learning and achievement. (Uline et al., 2009, pp. 417–418)

Much of the past research on the relationship between the physical attributes of educational environments and student learning, behavior, attitudes and performance drew comparisons across different settings.
Figure 1.

**School Climate**
- Teacher Professionalism
- Academic Engagement
- Community Leadership
- Collegial Leadership

**Facility**
- Elbow Room
- Movement
- Flexible Responsive Classrooms

**Quality**
- Play of Light
- Aesthetics
- Safety/Security

**Student Achievement**
- Identity of Occupants
- Personality of Space

**Influence of Occupants**

**Original Design**
Research investigating the effects of facility improvements over time is scarce (e.g., Maxwell, 1999; Plumley, 1978). A study in a corporate environment examined the perceptions of employees who were about to move into a new building, following up over a period of 5 years after the building was occupied (Hall & Hall, 1975). A study in a Syracuse, New York, public school evaluated student achievement scores before, during, and after renovation efforts and found a positive relationship between upgraded school facilities and math achievement (Maxwell, 1999).

Through this third phase of “The Walls Speak” research, we continue to explore the mechanisms of these relationships, this time exploring the interplay between quality facilities and school climate within schools slated for renovations in a large Southern California urban school district. This district was chosen to continue investigation of the relationship between facility quality and school climate within schools that serve a primarily disadvantaged (socioeconomically) student population. We entered the schools during fall semester, before commencement of extensive renovations, to explore the nature of the learning climate within school facilities deemed substandard. We were interested to know how the earlier-identified themes of facility quality manifested themselves within these inadequate facilities.

**STUDY DESIGN AND METHOD**

For this study, we utilized a mixed-methods triangulation design (Creswell & Plano Clark, 2007) so that quantitative data informed the qualitative data, directing further comparison and interpretation. Utilizing methodologies from the first two phases of “The Walls Speak” research, this study combined collective instrumental case study methods (Stake, 1995) with survey methods. Quantitative data were gathered from all nine schools scheduled for renovation during 2009 through 2011. This larger sample increased the reliability of the quantitative results. In-depth case studies were also conducted at three of the nine schools—two middle schools and one high school. In combination, these methods scrutinized the schools’ physical and social environments, describing the conditions of both before renovation activities. Data collected within one district held constant the factors of district-level organization and management. The study design and procedures were reviewed by the universities’ institutional review boards as well as the local school district.

The study applied the school leadership–building design model (Uline et al., 2009) to explore how school climate (academic press, community
engagement, teacher professionalism, and collegial leadership) interacts with six characteristics of facility quality (movement, aesthetics, play of light, flexible and responsive classrooms, elbow room, and security) within school buildings slated for major renovations. The three primary questions that directed this phase of the research were as follows: First, to what degree are the occupants of substandard school facilities cognizant of the presence or absence of various aspects of facility quality? Second, in what ways is the presence or absence of these qualities related to the school’s learning climate? Last, to what extent and in what ways do occupants compensate for the limitations of existing facilities to develop and nurture a positive learning climate?

SCHOOL DISTRICT PROFILE

The school district under study, South Central Union High School District, covers 154 square miles, crosses five incorporated cities, and includes several burgeoning urban fringe communities. These new developments are located east of a major freeway that divides the district. Since 2000, district enrollment has risen by approximately 7,000 to 42,000, with most of the growth occurring in these new neighborhoods. To absorb the growth, four new schools were built in this area, bringing the district’s total school facility stock to 32 campuses. In building a case for the most recent bond initiative, district officials underscored this increasing enrollment and acknowledged a concurrent inability to address an increased backlog of deferred maintenance. Allocating only the 0.5% general fund set-aside required to receive the state’s matching 0.5%, the district reported a shortage of $9 million necessary to keep abreast of the annual $12 million in scheduled maintenance.

Fiscally responsible completion of the first phase in a long-range facilities master plan, combined with a commitment “to improve learning and safety at every South Central Union High School District campus” (school district website), resulted in passage of a $644 million bond issue to fund Phase 2 of the plan. This current phase includes repair, renovation, modernization, and/or construction of classrooms, libraries, computer labs and science labs, lunch shelters, athletic buildings, and gyms. The initiative includes handicap accessibility improvements, as well as upgrades or replacements of lighting and electrical systems, heating air and ventilation systems, fire safety systems, bathroom facilities, and plumbing and sewer systems. Schools will also receive flooring and ceiling replacements, abatement of hazardous materials, roofing upgrades, window glazing replacements, and site improvements, including walkways, safety fencing,
and landscaping. All new school construction will incorporate Leadership in Energy and Environmental Design guidelines at the gold level.

Nine of the district’s oldest schools will be the first to receive these improvements. Selected on the basis of specific needs as identified through a comprehensive conditions assessment, the schools were chosen according to a worst-first principle. These nine compose the sample of the current study, with three case study schools and six additional schools where survey data were collected. The full nine-school sample increased the reliability of the quantitative measures; however, collective case study research in three schools added depth to the quantitative survey data.

CASE STUDY SCHOOL PROFILES

The three case study schools evidenced conditions that warranted comprehensive improvements and were schools where more than 50% of the student population received free and reduced-price meals. They represented three of the four original South Central Union High School District schools. East High School opened its doors in 1922. North and Federal middle schools, then junior highs, opened in 1929. Historical documents chronicle early alterations and additions, including Works Progress Administration–funded buildings on all three sites. Auditoriums at the two junior highs were funded in this manner. Following the 1933 Long Beach earthquake, a district survey deemed all the district’s schools unsafe in the event of future tremors. Although the 1933 Field Act set stringent requirements for new construction, pre-1933 structures were held to lesser standards. It was not until 1954 that most of the pre–Field Act structures were demolished (Hawes, 1994). All three case study campuses continue to utilize Works Progress Administration–funded buildings, including the aforementioned auditoriums. These buildings remain in use with only minor improvements, such as interior painting and window treatments that were donated to Federal Middle by a local church group who uses the facility for Sunday services. Although the auditoriums were signature features in both schools, they were of limited utility, given their age, lack of long-term improvements, and size. The auditoriums could accommodate only one fourth of the student body at any given time.

All three schools featured some construction that followed the modern architectural style popular throughout Southern California beginning after World War II. The modern style is characterized by its minimalist approach, utilizing industrially produced materials, including concrete, prefabricated concrete blocks, metal, and glass (McAlester & McAlester, 2006). The modern-style school buildings within the South Central Union
High School District can be described as large rectangular concrete buildings with concrete foundation; they have metal doors and metal-frame windows (fixed, awning, or hopper), with flat- or shallow-sloped gable roofs and little, if any, architectural details. The schools are outdoor campuses largely comprising one-story buildings. Campuses were developed in piecemeal fashion, adding permanent and portable buildings as enrollments required. In fact, many of the temporary structures have become permanent fixtures that have suffered steady deterioration with age and use (cf. Chan, 2009).

Data on the proportion of students receiving free and reduced-price lunches and students identified as gifted (Gifted and Talented Education), serving as a proxy for socioeconomic status, were obtained from the California Department of Education website. Aggregated student performance results provide further contextual data on the case study schools (see Table 1). These data are reported as the California Academic Performance Index, an index that accounts for a variety of school factors. These data show that in spite of challenges, the school occupants made substantial progress toward their achievement goals. Two schools in the study exceeded their achievement targets, whereas another showed growth but did not meet its goals on the index.

Table 1. Ethnicity, Socioeconomic Status, and Academic Performance Index Scores for Case Study Schools

<table>
<thead>
<tr>
<th></th>
<th>Federal Middle School</th>
<th>North Middle School</th>
<th>East High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student population, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Filipino</td>
<td>9</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>88</td>
<td>92</td>
<td>82</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>White, not of Hispanic origin</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>African American, not of Hispanic origin</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Free and reduced-price lunch</td>
<td>79</td>
<td>70</td>
<td>62</td>
</tr>
<tr>
<td>Gifted and Talented Education</td>
<td>18</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Academic Performance Index scoresa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008 growth</td>
<td>738</td>
<td>646</td>
<td>706</td>
</tr>
<tr>
<td>2007 base</td>
<td>702</td>
<td>643</td>
<td>691</td>
</tr>
<tr>
<td>2007–2008 growth target</td>
<td>5</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>2007–2008 growth</td>
<td>36</td>
<td>3</td>
<td>15</td>
</tr>
</tbody>
</table>

Note. Percentages may not add to 100 because of rounding [Q]

*The Academic Performance Index is a numeric index based on California’s Standardized Testing and Reporting program. The index is a weighted average of student performance as measured by norm- and criterion-referenced tests in English language arts, mathematics, and history-social science.

[Q: This note alright (Fed does not add to 100)? Or is the missing 1% attributed to other?]
PARTICIPANTS AND INSTRUMENTS

Researchers triangulated data through surveys, interviews, walk-throughs, and student-generated photographic documentation conducted at each case study school (Denzin, 1970; Merriam, 1988; Patton, 1990; Stake, 1995; Wolsey & Uline, in press). Teachers were the sole survey respondents. Researchers administered the surveys during regularly scheduled faculty meetings at the participating schools. A member of the research team assured faculty of the confidentiality of their responses, explained the general purpose of the study, and asked teachers to complete the surveys. Researchers did not attempt to gather data from faculty who were not present at the meeting; however, attendance was high at all faculty meetings, and all but two teachers in attendance returned usable questionnaires. The total number of teachers who responded to the surveys was 513 across the nine schools, for a response rate of 72% (see Table 2). In addition, 20 research participants were interviewed at each of the three case study schools, including the principal, the school custodian, as well as students, teachers, and parents. Teachers representing various grade levels and subject areas within the three case study schools were recruited to participate. Building principals selected students who represented the school population, using school demographics information that considered gender, ethnicity, grade level, and academic participation. Researchers were interested in the perceptions of high-performing students and those less engaged in school. Surveys and all interviews took place at the school site.

Table 2. Survey Response Rate for All Schools

<table>
<thead>
<tr>
<th>School</th>
<th>Faculty</th>
<th>Returned Surveys</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle schools (Grades 6–8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>38</td>
<td>28</td>
<td>73.68</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>27</td>
<td>67.50</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>27</td>
<td>54.00</td>
</tr>
<tr>
<td>4</td>
<td>52</td>
<td>32</td>
<td>61.54</td>
</tr>
<tr>
<td>High schools (Grades 9–12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>115</td>
<td>88</td>
<td>76.52</td>
</tr>
<tr>
<td>7</td>
<td>95</td>
<td>80</td>
<td>84.21</td>
</tr>
<tr>
<td>8</td>
<td>127</td>
<td>86</td>
<td>67.72</td>
</tr>
<tr>
<td>9</td>
<td>90</td>
<td>60</td>
<td>66.67</td>
</tr>
<tr>
<td>Total</td>
<td>708</td>
<td>513</td>
<td>72.46</td>
</tr>
</tbody>
</table>
SURVEY MEASURES

The survey consisted of questions developed to measure perceptions of facility quality and school climate. The School Climate Index consisted of four subscales that assessed various aspects of the quality of interpersonal relationships (Tschannen-Moran et al., 2006). For all survey items, respondents were asked to assess how frequently they perceived each statement to be true of his or her school (1 = never, 5 = very frequently). Factor analysis of the quantitative measures revealed that the four climate measures formed separate factors; however, the quality facilities measure was divided between two factors—one having to do with perceptions of the quality of the facility and the other, with the quality of the maintenance at the school. Consequently, we analyzed these as separate constructs.

Quality of school facilities. Teachers were asked to rate the quality of their school facilities by responding to five items that assessed their perceptions of the degree to which their school buildings were comfortable, attractive, and adequate for instructional purposes. These features tapped elements identified in previous research as being potentially related to student achievement (Uline & Tschannen-Moran, 2008). In the current sample, the alpha coefficient of reliability for the quality facilities measure was .78. Sample items include “This building is pleasing in appearance” and “The facilities here are adequate to support learning.”

Maintenance. Two items assessed whether the building was well maintained and the equipment and furniture were in good repair. Factor analysis revealed that these two items formed a separate factor from the five quality facilities items, and thus they were analyzed separately. The alpha coefficient of reliability for the maintenance measure was .81 in the current sample. Sample items include “The facilities here are lacking in regular maintenance” (reverse-coded) and “Classroom equipment and furniture are in disrepair” (reverse-coded).

School Climate Index. The School Climate Index is a 28-item measure of school climate comprising four subscales: Collegial Leadership, Teacher Professionalism, Academic Press, and Community Engagement (Tschannen-Moran et al., 2006). Collegial Leadership was assessed with 7 items (alpha coefficient in the current sample = .93), whereas Teacher Professionalism was measured with 8 items (alpha = .74). Academic Press consisted of 6 items (alpha = .89), and Community Engagement was measured with 7 items (alpha = .86). Sample items representing each of the respective subscales include “The principal puts suggestions made by the faculty into operation” and “Students respect others who get good grades.”

Note that in the first phase of “The Walls Speak” research project (Uline & Tschannen-Moran, 2008), the quality of school facilities was unrelated...
to the collegial leadership of the principal. Whether the principal was per-
ceived to have an open or authoritarian leadership style was unrelated to
the physical features of the school building. In the second phase, however,
we did observe an interaction between school leadership and building de-
sign, with leaders working flexibly with other occupants, discovering how
the design features of the building could be leveraged to improve both cli-
nimate and achievement (Uline et al., 2009). Thus, the Collegial Leadership
subscale was included in our analysis.

INTERVIEWS

All research participants were aware of the renovation plans to varying
degrees, owing in part to frequent meetings, the presence of architects and
facilities planners on campus, and an extensive financing campaign con-
ducted in the school district the previous year. Researchers interviewed
building principals, teachers, students, parents, and the school custodians
at the three case study schools. The interviewers employed a protocol with
semistructured questions about various features of the school building
and how these characteristics and conditions support or impede commu-
nication, interaction, and learning among students, teachers, and parents.
Semistructured interview questions encourage a degree of open-ended
response from participants yet take advantage of the codable nature of
preestablished categories (Fontana & Frey, 2000). Interview protocols
were similar across participant groups, although some questions were
tailored to fit the unique roles, responsibilities, and experiences of vari-
ous occupants. At the same time, the similarity of the questions allowed
comparisons of responses across these groups. Interviews with principals,
teachers, students, parents, and custodians took place at the school site
in a location that ensured confidentiality and privacy (e.g., a conference
room or unused classroom).

PHOTO INTERVIEWS

To further inform the researchers’ understanding of the school and the
perceptions of its occupants, digital cameras were provided to students,
with the assignment to spend approximately 40 minutes documenting
through the lens the ways that their school building affects their learning.
Photography is frequently used in field research because images are typi-
cally data rich, with visual information that can be analyzed by research-
Following the photo interview model at Federal Middle School and East
High School (e.g., Wolsey & Uline, in press), the researchers printed out 10 photos that the students selected as being most representative of their experience as occupants and students in the school buildings and environment. At North Middle School, students worked in teams of two at the request of the principal. They used digital cameras, then PowerPoint to label and manipulate the images. Researchers invited the student photographers to categorize the 10 selected photos for discussion purposes. Using an interview protocol (Creswell, 1998), researchers asked students to describe why they chose to make the photographs they did, how they determined the categories for the photographs, and why the subjects of the photographs do or do not contribute to the learning environment at the school.

WALK-THROUGH INTERVIEWS

The walk-through interview assists the researcher to experience the facility in the company of representative occupants to learn how they respond to the physical features of the school (Nelson, 2001). A parent, teacher, student, and administrator took the researchers on a tour of the building and shared their perceptions and feelings, as well as how they made meaning in response to the symbols and arrangement of space. The tour typically began outside the building, where participants shared the meanings they made of the symbols they encountered as they approached the front entrance. Other meaningful places included display cases and gathering spaces such as the cafeteria, media center, commons, auditorium, gymnasium, classroom, and computer lab.

DATA MANAGEMENT AND ANALYSIS

Quantitative data analysis from surveys administered to faculty was conducted simultaneously with qualitative data coding and analysis. The study was conducted in two overlapping phases using mixed-methods research design. In the triangulation design–data transformation model (Creswell & Plano Clark, 2007), quantitative data and qualitative data are collected simultaneously. Qualification of quantified data, however, permits interpretation and interrelation of the data sets.

Survey data analysis. Means and standard deviations for the nine schools were calculated. These means and standard deviations were then calculated with a comparison sample of 82 schools in Virginia and 97 high schools in Ohio to create comparison scores with a mean of 500 and a standard deviation of 100. Pearson correlation coefficients were used to explore the relationships between the quality of school facilities and...
school climate for the full sample and for each case study school (using the unstandardized scores).

Qualitative data management and analysis. With respect to qualitative data management and analysis, all interviews were digitally recorded and transcribed. Data were organized, classified, and coded with HyperRESEARCH, a computer software program designed to handle unstructured qualitative data (ResearchWare, Inc., 2007). Data analysis occurred continuously throughout data collection as the researchers identified emerging themes as well as attempted to tease out anomalies and contradictions (Holsti, 1969; Merriam, 1988). Some preliminary categories were generated from the literature and from Phase 2 of “The Walls Speak” research program. Additional themes and patterns emerged (Fook, 2002) during the analysis of interviews and photographic artifacts, taking into account differences in the quality of the facilities as perceived by study participants. Member checks and maintenance of an organized documentation system helped confirm the research findings. The privacy and confidentiality of all participants were maintained through the use of pseudonyms.

FINDINGS AND RESULTS

The school leadership–building design model acknowledges community and a sense of local history as being central to the ongoing interactions between the built learning environment and the building occupants (see Figure 1). Six broad themes derived from earlier research (Uline et al., 2009)—movement, aesthetics, play of light, flexible and responsive classrooms, elbow room, and security—were robust descriptors in the present study. However, because the schools were older and participants in the research perceived them as being in great need of maintenance and repair, the themes were often described as absent qualities or as anticipated qualities to be added or enhanced through the upcoming renovations. The renovation plans for the three schools reflect the six themes in various ways, with occupants describing their involvement in design decisions as well as their expectations for these future improvements. In addition, two new themes—counterbalance and equity—emerged as being significant to occupants’ interactions with their current facilities, with counterbalance capturing their efforts to offset limitations and equity reflecting their sense of the underlying injustice apparent in these circumstances. Quantitative analysis of survey data supports the contentions of interview participants. Table 3 reports descriptive statistics for variables from the quality facilities and school climate indicators and includes results standardized
with a comparative sample. For each case study school, the quality facilities indicators produced the lowest mean. Finally, the social environment, measured according to the various factors of school climate (academic press, community engagement, teacher professionalism, and collegial leadership), interacted significantly with the occupants’ perceptions of the physical learning environment at these schools. We present quantitative results and qualitative findings in an integrated fashion according to the mixed-method research design.

DESCRIPTIVE STATISTICS

For the full sample of just over 500 teachers who participated in this study from across nine schools, the mean score for quality facilities was 3.16 on a 5-point scale. This was somewhat lower than the mean score for the other four climate scores, which ranged from 3.43 to 4.02. The standard deviations ranged from 0.51 (for quality facilities) to .67 (for community engagement) and .86 (for collegial leadership), demonstrating adequate variability (see Table 3).

For all three cases in the present study, the quality facilities score was below the mean of 500 for the comparison sample, with Federal and East more than a standard deviation below the mean with scores of 376 and 345, respectively, which means that the perceptions of these teachers fell in the bottom 13% of schools in the comparison samples (see Table 4). North was just below the mean of the comparison schools with a score of 474. The maintenance scores were also low, with Federal at 436 and North at 446. East’s score was more than a standard deviation below the mean, at 349. At Federal, the scores for academic press, teacher professionalism, and collegial leadership were close to the mean of 500, whereas the score for community engagement was almost a full standard deviation below the mean. The perceptions of the teachers at North were above the mean.
for community engagement, academic press, and collegial leadership and well above the mean for teacher professionalism. At East, the scores were above the mean for academic press, almost at the mean for community engagement, and slightly below the mean for teacher professionalism and collegial leadership. Although the sample schools are from different states and regions, there are sufficient similarities to make the comparisons useful. Furthermore, there were no comparable data currently available for California schools.

COUNTERBALANCING FOR ACADEMIC PRESS

For academic press, a positive correlation with facility quality was found, indicating that the facilities, even with their limitations, interacted in some significant way with this climate factor (see Table 5). The correlation between facility quality and academic press for the full sample was moderate ($r = .37$, $p < .01$), whereas the correlation for the maintenance measure was .21 ($p < .01$). The correlations between facility quality and

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Score a</th>
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</thead>
<tbody>
<tr>
<td>Federal Middle School ($n = 28$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collegial leadership</td>
<td>3.88</td>
<td>0.83</td>
<td>499.2</td>
</tr>
<tr>
<td>Teacher professionalism</td>
<td>3.92</td>
<td>0.61</td>
<td>495.5</td>
</tr>
<tr>
<td>Academic press</td>
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<td>0.61</td>
<td>493.1</td>
</tr>
<tr>
<td>Community engagement</td>
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<td>0.79</td>
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</tr>
<tr>
<td>Quality facilities</td>
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<td>0.62</td>
<td>375.7</td>
</tr>
<tr>
<td>Maintenance</td>
<td>3.26</td>
<td>0.61</td>
<td>435.9</td>
</tr>
<tr>
<td>North Middle School ($n = 27$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collegial leadership</td>
<td>4.07</td>
<td>0.75</td>
<td>548.4</td>
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<tr>
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<tr>
<td>Academic press</td>
<td>3.69</td>
<td>0.52</td>
<td>535.5</td>
</tr>
<tr>
<td>Community engagement</td>
<td>3.62</td>
<td>0.49</td>
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<tr>
<td>Quality facilities</td>
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<tr>
<td>Maintenance</td>
<td>3.31</td>
<td>0.52</td>
<td>445.5</td>
</tr>
<tr>
<td>East High School ($n = 88$)</td>
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<td></td>
</tr>
<tr>
<td>Collegial leadership</td>
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<tr>
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<tr>
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<td>345.0</td>
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<tr>
<td>Maintenance</td>
<td>3.20</td>
<td>0.63</td>
<td>349.3</td>
</tr>
</tbody>
</table>

*a A score of 500 is average based on the comparative sample of 82 middle schools in Virginia and 97 high schools in Ohio. Each increment of 100 points is equal to one standard deviation.
academic press for the three case study schools ranged from weak at the high school \((r = .19, \text{ ns})\) to moderate at the two middle schools \((r = .53, p < .01, \text{ for both; see Table 6})\). These results support evidence from interview data across occupant groups. Students, teachers, principals, and custodians described the ways in which they attempted to maintain academic press in facilities that work against this focus and sense of order in regard to academics.

Occupants often described how they compensated when they perceived that the facilities lacked important qualities they thought would promote learning and achievement. For example, when air conditioning was not available, teachers often brought in their own fans to aid air circulation, counterbalancing the effects of intolerable classroom temperatures. As one teacher at East High School pointed out,

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...so you see my orange extension cord, which my dad stapled, extending to the front of the room to use those two fans. We're year round, and it gets over 100 degrees in here during summer months. Necessity is the mother of invention!
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A teacher assigned to an old classroom stated that she almost cried when she saw her classroom for the first time, with holes in the walls, mismatched paint, and no bulletin boards. She told researchers, “I made the best of it. I begged, borrowed, and got whatever I could to make the room into a classroom setting.”

<table>
<thead>
<tr>
<th>School</th>
<th>Collegial Leadership</th>
<th>Teacher Professionalism</th>
<th>Academic Press</th>
<th>Community Engagement</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal ((n = 28))</td>
<td>.49**</td>
<td>.29</td>
<td>.53**</td>
<td>.44*</td>
<td>.67**</td>
</tr>
<tr>
<td>North ((n = 27))</td>
<td>.53**</td>
<td>.38</td>
<td>.55**</td>
<td>.47</td>
<td>.36</td>
</tr>
<tr>
<td>East ((n = 88))</td>
<td>.20</td>
<td>.19</td>
<td>.19</td>
<td>.33**</td>
<td>.31**</td>
</tr>
</tbody>
</table>

*\(p < .05\), **\(p < .01\).
Students compensated in different ways, too. The noise in some classrooms was noted; students were forced to bring additional cognitive resources to bear, to filter noise and distractions. Ms. French, a parent, described how she helped her son compensate for the poor heating and air conditioning by purchasing a sweatshirt for her son. However, her son lost the sweatshirt when he became too hot and had nowhere, such as a locker, to store it. According to Mr. Perez, the custodian at Federal, “We [the staff] adapt to whatever. They adapt, these kids. Now can you just imagine if you get them the right tools and the right building, what they could do?”

One student at Federal Middle School spoke to the resilience of students and their willingness to respond positively and work hard to achieve the goals that teachers set for them. She suggested that even though the buildings were old, it all came down to “a matter of you wanting to learn.” As she described her photographs to one researcher, she made special note of the category under which she had placed a picture of her math classroom. “I decided to put this photograph in the category ‘special to me.’ My teacher crams up the desks a little and she adds more in the aisle. That’s completely fine, because she’s getting all of us to pass math.”

When describing their attempts to maintain a serious academic environment within the existing learning spaces, occupants looked forward to the renovations and the changes they would bring. Because all participants were aware of the renovation plans and many had been involved in planning activities, they tended to focus on the changes to the building when asked about the current facility.

WELCOMING APPEARANCE AND COMMUNITY ENGAGEMENT

In the full sample, facility quality was positively related to community engagement \((r = .39, p < .01;\) see Table 5), indicating that the facilities, even with their limitations, interacted in some significant way with this climate factor. The maintenance measure was also related to community engagement, although not as strongly \((r = .21, p < .01).\) Among the case study schools, community engagement showed moderate relationships with facility quality \((r = .44, p < .05,\) at Federal; \(r = .47, n.s.,\) at North; and \(r = .33, p < .01,\) at East; Table 6). In many cases, the historical connection, linking past students and teachers with current occupants, persisted over time. Building occupants across all research participant groups at the three case study schools described deep connections to the community of learners within the school walls and to the larger community outside those walls. They further underscored the ways in which these connections helped school occupants enhance the facilities, where possible, and overcome the difficulties they encountered.
Mr. Perez, the custodian at Federal Middle School, described the ways in which he and his staff went the extra mile to make the school a more inviting place for students and the community:

When I first came, the buildings were all brown. Somebody came with the paint, maybe it was on sale, and painted everything brown. There’s a custodian right there painting [off-white, with blue and yellow trim]. He comes about 10 before his 2:30 shift starts . . . and donates 3 hours of his time.

As occupants and visitors approach each case study school, they are confronted with austere, deteriorating façades. The walls were sometimes characterized as “institutional” or as a “fortress.” Each school’s lobby contained student work projects and trophies from sports and academic events, yet each was small and dark. School leaders made a concerted effort to ensure that they or members of the staff greeted students at the main entrance each morning.

As Mr. Hempstead, principal at East High, stood facing the front of his school, he described it as having an historical flavor but “very much outdated” and “crumbling.” When asked about the envisioned changes, he talked about how East High will become a point of pride for the community:

The three-story building that will rise right here will incorporate some of the features of the old historical school that actually predated this building. A large atrium when you enter will be very welcoming. This will be the nicest public building in the city.

Participants looked forward to the renovations with a sense of pride.

TEACHER PROFESSIONALISM AND COLLEGIAL LEADERSHIP

In the full sample, moderate correlations were found between teacher perceptions of facility quality and their assessments of the professionalism of their colleagues \((r = .43, p < .01)\) and the collegial leadership of the principal \((r = .30, p < .01; \text{Table 5})\). The maintenance measure was weakly related to teacher professionalism \((r = .13, p < .01)\) and collegial leadership \((r = .12, p < .01)\). In the three case study schools, teacher professionalism did not interact in a significant way with teachers’ perceptions of their facilities (Table 6). Although the facilities quality comparison scores (Table 4) all tended to be low, the teacher professionalism ratings in these three schools ranged from mid to high. Mr. Carello, the principal at Federal, underscored the point:

You know, the physical space is not optimal. There are a lot of challenges, but the reason why we’re doing so well, the culture and the school climate, is
because of our teachers. We have some amazing teachers here who are committed to kids, and that's why we're successful.

It is noteworthy that collegial leadership reflects the second-highest mean for all three schools. Results of the quantitative analyses demonstrated moderate correlations between facility quality and collegial leadership at both middle schools ($r = .49, p < .01$, at Federal; $r = .53, p < .01$, at North; Table 6) but not so at the high school.

MOVEMENT

A clear sense of entrance and circulation influences the educational function of a building (Castaldi, 1994). Two competing aspects of movement emerged from the data. In many cases, participants thought that their movements were largely unrestricted as they moved about campus. However, the campuses became difficult to navigate as the school population grew and classroom assignments lost the coherence they may have once had. Annie, an eighth-grade student, told researchers, “Everything should be close. You have lunch all the way over here in the [student government office] and then you have a period in the trailers. And, the teachers hurry you to go.”

Pathways were not always clearly marked. Teachers reported using oral directions to help lost students navigate the campus. Parents at East High also expressed concern:

Our school’s so fragmented. The numbering system makes no sense. There are tiny doors into the attendance office, the principal’s office, and the assistant principal office. There’s a building on the other side of campus for counselors. When parents come, it’s not approachable at all, not right now.

Deferred maintenance of outdoor hallways has left walkways in a state of disrepair, further deterring students’ movement across campuses. According to Mark, the hallways at Federal are “hard to walk on [when] the asphalt is cracked, especially if you have the backpacks that are on wheels. Most students don’t use those because of the floors.”

AESTHETICS AND SIGNATURE FEATURES

Aesthetics pertains to a sense of beauty and appeals to human emotion and sensations. Thus, the aesthetic features of a school can cultivate a strong sense of belonging and generate enthusiasm for learning because of the emotional responses of those features (Jarman, Webb, & Chan, 2004). Aesthetics figured prominently in occupants’ perception of the school environments reported in the present study. In spite of the age of the fa-
cilities and the other features over which occupants felt little control, past and present occupants had expended effort to make the learning spaces their own.

At North Middle School, the principal had installed a decorative fountain approximately 5 years before the researchers’ visit. It replaced a 75-year-old tree that had split apart and died. One teacher told researchers about the day the tree could no longer stand: “It just decided it wasn’t staying up anymore; it went down. The student government wanted to replace the tree with something aesthetically pleasing and suggested a fountain.” One teacher participant reported, “There were the pessimists as always. ‘Kids will throw trash in there.’ But fortunately the optimists triumphed and it’s—I think it is so beautiful.” Although the fountain was installed before any of the current students arrived at North, it became a focal point for the school, and every student interviewed noted its centrality to his or her conceptions of the school. Students Rosie and Agatha presented the school fountain in a PowerPoint slide (see Figure 2). To add emphasis, they went online to find another colorful fountain they thought highlighted the value they placed on the one at their school. This decorative fountain served as a signature feature that distinguished North Middle School. Mr. Martinez, principal at North, pointed out that the fountain was also a gathering place for the community of learners and a place of quiet reflection.

Murals painted by staff and students decorated the walls at North. A teacher, Ms. Fernandez, told researchers, “They were students that were here at the time . . . it’s very historical.” For many faculty and staff members, these efforts represented a long-term commitment to the place.

The principals at all three schools expressed concern for the message that their facilities communicate to students, parents, and the community at large. Mr. Hempstead, principal at East High, lamented a history of shortsighted infrastructure decisions. In planning for upcoming improvements, he advanced key principles that would drive all decisions. The first addressed the presence of state-of-the-art classrooms for every period of a student’s day. The second one called for open space and green space for kids here. As you can see, for whatever reason, who knows why, it was deemed okay, over the last 20, 30 years, to just blacktop East High. So it’s basically a blacktop jungle with a forest of relocatable classrooms. Aesthetically it’s horrible.

Hempstead urged,

If you can fast-forward in your mind about 3 or 4 years: these buildings are gone. That set of bungalows is relocated into a straight line, so here you’ll be looking at grass and trees and open space the kids desperately need.
Pretty Fountain in Quad Area
FLEXIBLE AND RESPONSIVE CLASSROOMS

In an earlier case study of schools with high building quality ratings (Uline et al., 2009), students and teachers believed that their classroom and other learning spaces accommodated their learning needs and could be modified to a certain extent because of the physical dimensions of the room. In the present study, participants sometimes noted that classrooms were inflexible in some ways. For example, older classrooms often lacked adequate electrical outlets and infrastructure for technology.

Teachers underscored the lack of flexibility to arrange the space in their classrooms to various educational purposes. One teacher described the limitations of the portables classrooms as

long and narrow, making it hard for me to walk up and down the aisles to support students, coach them. The space in the classrooms also makes it difficult for kids to move around, to get into their groups, to work on a project comfortably.

Students also underscored furniture as a hindrance to their learning. In many instances, students did not like being confined by the chair–desk combinations. Fausto pointed out, “I think it’s better if we just have a chair and a table. You can move easily” (see Figure 3). Finally, students and
teachers often reported that the noise level in portable classrooms was intolerably high at times, when students needed to study or concentrate on a test, for example.

CLEANLINESS AND BASIC NEEDS

An unanticipated finding within the first phase of research (Uline & Tschannen-Moran, 2008) involved the cleanliness and neatness of the building. This factor functioned independently of the other indicators of building quality. Furthermore, the mean for this indicator was higher than that for the other items in the scale; even when participants rated their school buildings as lacking in other areas, they were at least kept clean and neat. Both middle schools were generally clean; that is, they were free of graffiti and trash. During walk-through interviews, the researchers noted that students did not throw trash on the ground. Custodians worked hard to ensure that gum was not stuck to the sidewalks and that the common areas were hosed down or swept regularly. Middle school parents in focus groups thought that the schools were clean, including bathrooms and cafeteria areas, and they indicated they did not hear their children complaining about cleanliness.

Some basic needs were not met for students and teachers. Teachers were concerned with the lack of accessible restroom facilities. They pointed out that although the number of restrooms might meet health standards for the population, most were too far away to be accessible during relatively short passing periods of approximately 5 minutes.

Custodians noted that insects were a problem, which they attributed in part to the age of the buildings. Mr. Martinez pointed out, “a lot of termites because the buildings are so old, especially in the auditorium.” Students reported that areas of the school were not clean; however, analysis of the photographs indicated that students generally perceived areas in need of maintenance as not being clean. For example, Mark at Federal Middle School photographed telephone wires that were no longer attached to the wall and labeled the photograph “dirty corner,” although the floor and area were generally free of debris. At North Middle School, Alice and Fausto photographed rusty railings and drinking fountains and characterized these as dirty. Peeling paint and cracked ceiling tiles appeared frequently, and students told researchers that these appeared dirty or were unpleasing sights as well.

In a recent study, researchers surveyed occupants from 33 public schools serving Grades 6 through 8 in a large mid-Atlantic city to examine relationships among this sort of physical disorder (e.g., broken windows
and poor building conditions), fear, collective efficacy, and social disorder (Plank et al., 2009). Through path analyses, data from the study revealed a direct association between physical disorder and social disorder even when prior levels of collective efficacy were controlled. This finding is consistent with traditional broken-windows theories, which maintain that “broken windows and other visible signs of physical disorder ... signal to people that no one cares about the place; thus people are likely to choose these places as sites to partake in ... social disorder” (p. 228). Furthermore, evidence indicates that the effects of physical disorder may be operating through increased fear and decreased collective efficacy to effect perceptions of threatening or violent interactions among people. Plank and colleagues urged educators and researchers “to be vigilant about factors that influence student perceptions of climate and safety” (p. 244; emphasis added).

For too many years, school building maintenance, repairs, and construction took a backseat within the schools under study, resulting in just such deteriorating and inadequate learning environments. Although occupants at these schools felt a strong connection to the buildings and noted features of significance, they spoke with cautious optimism about the upcoming renovations and improvements, recognizing the need to demolish some parts of the school buildings. Ms. Fernandez at North Middle School indicated her feelings about older classroom buildings that were slated for destruction, with new construction to take its place: “It’s a little sad, but I know why they’re going to be doing it. I mean because the building is pretty much falling apart.”

VIEWS AND PLAY OF LIGHT

Research continues to demonstrate the importance of windows and views, as well as various forms of light—especially, daylight (Heschong Mahone Group, 1999; Tanner, 2009; Wurtman, 1975). Views to the outside provide necessary visual rest and relief (Kuller & Lindsten, 1992). Annie, a student at North Middle School, told a researcher that many of her classrooms did not have views to the outside. She said, “You know it’s because sometimes you just want to take a break like ... okay, look outside. Sometimes there’s a point where you can actually feel claustrophobic.” Older windows had sometimes taken on a glaze that restricted views in and out of the learning spaces. Conversely, some windows were oriented in such a way that late-afternoon sun beat through the glass into the classrooms, creating glare and adding to the temperature-control problems already present in the older buildings.
Teachers and students reported variation in the adequacy of classroom spaces to accommodate learning. One teacher reported that when classes reached maximum size, the space seemed more restricted: “When I have the full class load . . . it feels very tight in there, because I use a lot of equipment in the front of the room with technology that takes space.” Another teacher at North pointed out that the older classrooms were much bigger than the newer classrooms and portables. She called them “spacious” in comparison. Because the two middle schools had received additional funding, enrollments in math classes were smaller than those of other subjects, which improved elbow room within these classes. Common learning spaces, such as the auditoriums and libraries, were reported as being inadequate given the size of the student population at each school.

One high school student labeled a series of her pictures “chaos” to describe the effects of close quarters in bathrooms and hallways across campus:

Places like the bathrooms are really small and, as soon as the nutrition bell rings, everybody races to line up. We need more space in the classrooms, bathrooms, and front office. The hallways are also way too narrow for all of us. So it’s like chaos. We’re all ramming into each other and people are getting mad at each other.

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 one another or force occupants into crowded spaces, adults and students are more likely to violate personal space, which raises tensions. However, well-designed hallways allow passersby to move about comfortably (Tanner & Lackney, 2006).

SAFETY AND SECURITY

Across the groups of parents, administrators, students, and teachers, the three campuses were considered safe environments. The need to control access to the school buildings and grounds contrasted with the perception that the schools were fortress-like, with a single point of egress or ingress during the school day. All groups recognized this as a security measure. A teacher highlighted the need for security balanced against the need for the school to welcome students and parents inside as well: “You want your school to be a secure place you can leave your kids, but you also want to have it look inviting.” A school custodian suggested an interaction between occupants and the environment when he told researchers,
Well, I think that goes back to everyone cooperating and doing their share of the work. Meaning, we start with kids. You know every morning they have their shirts tucked in, their appearance is good, no gum. That helps us. So it’s a domino effect.

EQUITY

Research participants perceived differences between their facilities and the neighboring schools. In some cases, parents noticed the differences because they were simultaneously employees at one campus and parents of students on another in the same area. The custodian at Federal Middle School also worked at one of the schools east of the freeway. He observed stark differences between the two schools:

There is no comparison. Everything is new. The computer lab has the latest computers. In our auditorium there is no [air conditioning] and the heater doesn’t work. There you will see a state-of-the-art theater. You push a button and screen comes out, and [here] we’ve got some ropes and a ripped curtain. It makes me upset.

Students also appeared cognizant of the inequities. As Marissa accompanied one researcher on a walkthrough of East High, she talked about the differences she observed and her classmates’ overall response to them:

East High is a good school, but I think we do deserve a lot more, especially since we’re bringing up our test scores. When we hear in the news that other schools are getting all-weather tracks, bigger classrooms, or more parking lots, then you think, “Oh, aren’t we as good as them?” But, we still remain satisfied. We’re not protesting or complaining. We do what we have to do to succeed.

These inequities manifested as a theme within a single campus. In each case, some limited renovations had occurred a few years before the current large-scale renovations. In these instances, school occupants noted that some classes were more spacious, included better air circulation, and had increased capacity for technology, whereas older classes lacked these. During a walk-through interview at North Middle School, a teacher underscored these differences as she and the researcher toured her classroom. “So, this is our humble abode. [The kids] are pretty okay with it, except when they go over to the nice new buildings [across the campus] and then they say, ‘Oh, Ms. Wiley, it’s so hot in here.’”

Through their photographs and interview responses, student occupants at all three case study schools demonstrated keen powers of observation. They noticed the limitations of the school buildings they currently inhabited and appeared acutely aware of the degree to which various aspects of the...
physical learning environment satisfied their needs and desires or failed to do so. Adults across all participant groups underscored their efforts to mediate the potentially negative effects of these conditions and welcomed the anticipated improvements. Children and adults alike agreed that these upgrades would go a long way to increase equity across individual campuses and throughout the district. Principals noted that new growth in the district led to newer facilities in the more affluent sections of the communities served. Parents and students, as reported here, often had opportunities to visit other district schools and were able to compare the facilities and landscaping between new facilities and their older home schools. Although custodians and other occupants worked hard to maintain the facilities and keep a focus on academic press, the age of the facilities created a greater demand for deep maintenance and attention to aesthetics and appearance. Students were quick to clarify that they valued their schools for teachers and administrators who cared and worked unfailingly on their behalf.

LIMITATIONS

Several limitations should be considered in interpreting the results of this study. Although the measure of teacher perceptions of school facilities was based on aspects of facilities that have been found to be related to student achievement, the data were necessarily self-reported and subjective. Researchers have recommended that these perceptual data be aligned with more objective measures of the same buildings (Picus, Marion, Calvo, & Glenn, 2005), whereas recent research has identified the strengths of such occupant self-report measures as providing user assessments in accordance with educational purpose rather than engineering-focused, property-management measures that take no account of the educational adequacy of school buildings (Roberts, 2009). In either case, this measure must be tested more extensively. Similarly, measures of building quality and maintenance were included on the same survey as the school climate variables, leaving open the possibility of same-source or response-set biases.

DISCUSSION AND IMPLICATIONS

Occupants of the schools under study took great pride in their identities as learners, teachers, and members of the school community. They recognized the connection to previous occupants through historical artifacts, such as the auditoriums that were landmarks in the community as well as the murals painted by members of the community from times past. At two of the three case study schools, Federal Middle School and East High School, students had made noteworthy strides in achievement. In
East High School succeeded in reversing a 5-year downward trend, making them one of several high schools to exit program improvement status. These promising results, even in the face of woefully inadequate school facilities, appear to run counter to earlier findings and yet recall the mediating influence of school climate. In the schools under study in earlier phases of our research, the school's climate interacted with characteristics of facility quality, mediating their combined influence on student learning and achievement. The 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.

One possible explanation for the successes at these schools may be the generally positive school climate at the three case study schools—especially, the high levels of teacher professionalism at one of the three schools, supporting occupants' capacity to counterbalance the aspects of the facilities that they perceived as being inadequate. Yet school leaders can ask just so much of their teachers. For too long, poorly resourced school districts have been compelled to rely on the heroic efforts of dedicated educators. Even as teachers work hard to overcome the physical barriers to learning, attempting to maintain academic press, these extra efforts inevitably detract from the energies they have available for high-quality instruction. As reported earlier, the results of recent research related to the choices that teachers make about where they work revealed that facility conditions feature prominently among influences determining these decisions (Horng, 2009). Thus, poor-quality facilities appear to exacerbate already-existing inequities in multiple ways. Not only do students lack access to state-of-the-art learning environments available to their more affluent peers, but they may also fail to benefit from high-quality instruction, given that teachers choose to work elsewhere within environments more conducive to learning and teaching. Furthermore, the poor-quality facilities within these poorly resourced districts have been shown to reduce collective efficacy, even when people spend time and effort to overcome their shortcomings (Plank et al., 2009). Indeed, educators may benefit from continued research on facility conditions as a contributing factor to the achievement gap, a largely neglected aspect of this persistent problem.

**CONCLUSION**

Findings from this study underscore the complexities of the relationships between the physical environment of schools and the experiences of building occupants. We are reminded that schools exist within larger social, political, and fiscal circumstances, all of which influence decisions about how we will invest in the design, construction, and ongoing support and
maintenance of our schools. These same dynamics also influence the ways that we assess, or fail to assess, the outcomes of our decisions—both in terms of bricks and mortar and in terms of our larger educational intentions. Thus, students, teachers, parents, and communities may either enjoy learning places that maximize the unity of form and purpose, or they may persevere within spaces that stand at odds with the goals of teaching, learning, and community health and well-being.

School district administrators carry primary responsibility to speak on behalf of these matters with authority and enthusiasm for the full range of possibilities presented by the design and construction of new or renovated school facilities. District leaders are positioned to place the needs and requirements of their schools’ occupants before the public with confidence, actively engaging educators, design professionals, and community members within the larger planning process. As they work to ensure economy, safety, equity, and the long-term maintenance of the school district’s investment, they are wise to address the social, emotional, and aesthetic dimensions of their school facility stock. Evidence presented here suggests that the aesthetic aspects of the physical learning environment play a prominent role in creating and sustaining a productive learning climate within schools. Likewise, as policymakers continue to debate the virtues of national testing and standards, accountability systems, parental choice, charter schooling, and the nature of 21st-century teaching and learning, sooner or later they must face the condition of the environments within which these activities will or will not take place.

Subsequent inquiry will track changes in climate and achievement as they relate to the various improvements in building quality. As the renovations are completed, the research team will return to the school sites to investigate the effect of the new facilities on occupants’ perceptions, achievement, and sense of efficacy as learners, teachers, and other members of a learning community.

NOTES

1. According to recent national estimates, 21% of U.S. schools are more than 50 years old and another 50% are at least 30 years old, requiring a total of $127 billion in new construction and retrofitting (Office of Education Research and Improvement, 2000). A National Education Association (2000) 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.

2. The Field Act of 1933 “requires that the building designs be based on high level building standards adopted by the state,” with “the quality of construction . . . enforced through independent plan review and independent inspection. The Field
Act, as adopted, applied only to new construction; not to existing pre-1933 school buildings” (Department of General Services, 2007, para. 3).

REFERENCES


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