Mapping School Design: A Qualitative Study of the Relations Among Facilities Design, Curriculum Delivery, and School Climate

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Mapping School Design: A Qualitative Study of the Relations Among Facilities Design, Curriculum Delivery, and School Climate

Neil Gislason

ABSTRACT: The author conducted a 3-week qualitative case study at the School of Environmental Studies (SES), a senior public school with an environmental studies focus. He argues that SES's physical design facilitates collaborative, multidisciplinary teaching practices especially suited to the school's environmental studies curriculum. He also shows that the school's open plan architecture positively contributes to the social climate at SES. Students who were interviewed as part of the study expressed a preference for the open plan setting over conventional classrooms because the open design helps them socially connect with a larger number of peers than would be possible in a more enclosed environment. Students consequently felt more socially accepted at SES and better enjoyed their time in school in comparison with other high schools they had attended.

KEYWORDS: curriculum, educational facilities, environmental education, school climate, team teaching

The present research outlines the impact of school architecture on the teaching and social climate at the School of Environmental Studies (SES). I argue, first, that SES’s open plan design is geared toward team teaching rather than traditional classroom teaching. Team teaching is, in turn, integral to the school’s environmental studies program because it brings together instructors with expertise in the several disciplines that are woven into the core curriculum. In this way, SES’s design supports teaching practices particularly suited to the school’s environmental studies program: Design, instruction, and curriculum are all linked in a mutually supportive fashion. The school’s outdoor learning spaces likewise facilitate environmental education by enabling students to develop their observational and analytic skills in a field setting.
I also argue that the open plan architecture positively contributes to social climate at the school. Students whom I interviewed as part of the study expressed a preference for the open plan setting over conventional classrooms because the open design helps them socially connect with a larger number of peers than would be possible in a more enclosed environment. Students consequently felt more socially accepted at SES and better enjoyed their time in school, relative to other high schools they had attended.

Furthermore, I consider limitations in the school's design and discuss the negative effect of moderate levels of noise and student traffic on the learning environment at SES; I found that the students do not allow noise and traffic to become excessive because they are academically motivated and wish to maintain an orderly learning environment.

**Context of the Study and Methodology**

SES was one of the schools I studied as part of my doctoral research on school design, which focused on three open plan high schools in the Minneapolis-St. Paul area. I chose this area because of the number of open plan schools clustered there. Such a study is exploratory by nature because there is no established framework for conducting school design research, and no one has systematically examined how school architecture informs teaching and learning (Higgins, Hall, Wall, Woolner, & McCaughey, 2005).

Although there is only a modicum of research on the relation between school design and educational practice, there are two areas of research that provide some footing in this regard. First, studies on open plan schools show that the links between design and practice are not simple; the widespread failure of the open plan model in the 1960s and 1970s occurred largely because teachers were unable or unwilling to adapt their classroom practices to an open setting (Beardsley, Bricker, & Murray, 1973; Bennett, Andreae, Hegarty, & Wade, 1980; Gislason, in press; Rothenberg, 1989; Woolner et al., 2005). Second, research on school reform and organization indicates that wide-scale shifts in educational practices depend on teachers' readiness to adopt new instructional methods; educational change, therefore, involves cultural change (Elmore, 2004; Fullan, 2001). Taken together, these findings suggest that success in open plan schools depends on whether teachers (a) implement practices suited to an open setting and (b) are committed to developing these practices in the first place.

Owens and Valesky's (2007) school environment model is, to my knowledge, the only conceptual model that accounts for the interactions among school design, teaching, and school culture. Owens and Valesky posited that the school environment is constituted by four interrelated dimensions (see Figure 1). **Ecology** refers to school facilities, technology, and other material elements within a school setting. **Organization** encompasses teaching and planning practices, curriculum, and other aspects of how a school operates and is organized. **Culture** refers to the assumptions and values, as well as to group-level patterns of thought and behavior, shared among staff. **Milieu** entails students' sense of motivation, social patterns within the school, and other psychosocial dynamics among students.

This schema adequately accounts for the fact that design does not fully determine educational practice because it recognizes that teachers organize their use of space and time in particular ways (thus, organization informs ecology). The model also acknowledges the cultural component underlying teaching, which is critical given the significance of staff culture relative to educational practice. Last, the model recognizes that students have an influence, as do design and teaching, on motivation and social climate.

Owens and Valesky's (2007) model offers a good conceptual framework for school design research, but it is marked by two significant limitations. First, the researchers did not adequately describe how the four dimensions relate to one another in school settings; for example, they did not explain how milieu influences school culture or organization. Second, the authors did not consider in any detail
how material elements, such as building layout and computers, shape teaching and learning. This is a significant oversight, particularly because the model highlights ecology as an environmental factor. Physical settings clearly have an impact on the educational process, even though this influence may be mediated by how teachers decide to use school space and time; for example, teaching in a theater space is bound to be different than teaching in a computer lab. Nevertheless, despite its shortcomings, Owens and Valesky’s model remains useful for school design research.

One of the model’s major strengths is that it links building design (ecology) and teaching (organization) as complementary elements. This linkage provides a theoretical basis for studying how well school settings support various educational activities and, conversely, how well suited those activities are to their physical setting. SES offers a helpful illustration of the complementary relation between design and practice. The school’s large, open instructional spaces lack internal partitions, which makes it impossible for teachers to maintain strict control over their own environment. As a result, teachers must work together to ensure they do not interfere with one another’s activities, preventing, for example, one teacher playing a video while another one is lecturing nearby. Although this constant potential for cross-interference may be a major drawback for conventional classroom teachers, it is not considered a significant problem at SES: Planning and instruction are done collaboratively as a matter of course, so managing a large shared space is not viewed as a serious impediment. The school’s organization of teaching and planning is, in this way, consistent with the design of the facility (team teaching is examined more closely in the following sections).

Another advantage to the model is that it offers a conceptual basis for exploring the relation between staff culture and educational practice. Why, for example, would teachers choose to invest

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**FIGURE 1. School climate model.**

- **Ecology:** Building design, technology, and other material elements
- **Organisation:** Teaching, scheduling, and curriculum
- **Culture:** Assumptions, values, and patterns of thought and behavior
- **Milieu:** Learning and motivation, social climate

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their time and energy in team teaching? What assumptions about teaching and learning support this instructional arrangement? Is there a philosophical backdrop to team teaching? Are there particular patterns of thought and behavior associated with collaborative teaching? Such questions are vital because they provide insight into the aims, values, assumptions, and behaviors that drive a given program. The role culture plays is especially salient when there is a tight fit between a particular design and an educational program because both the program and the design may be closely associated with distinct values, assumptions, and behaviors.

Last, the model acknowledges that milieu shapes, and is shaped by, school environments. At SES, for example, the open setting helps foster a sense of community among students because there are so few physical barriers to social interaction. Although this physical openness could easily lead to off-task social activity, the students remain generally focused on their work because they are highly self-motivated and respectful of the need to maintain an orderly learning environment (milieu thus mediates the effect of ecology on behavior).

In summary, Owens and Valesky's (2007) model offers a framework for school design research, but it should be clarified and expanded in several respects. I suggest, first, that design (ecology) and teaching (organization) should be treated as directly complementary elements. Second, culture may be usefully viewed as a scaffold for educational practice. Last, milieu should be considered as both an environmental effect and a mediating factor: Building design and teaching practices influence behavior and motivation, yet milieu colors how students respond to their environment.

I used my expanded version of Owens and Valesky's (2007) framework as the theoretical frame for my field work at SES, letting it guide my central research questions: How does SES's design affect teaching (if at all)? What, if any, relation exists among design, teaching, and curriculum at the school? Do building design and teaching practices inform student motivation and social climate? If so, how? Is there a particular staff culture associated with the school's educational program or the design of the school? I arrived at the school with little knowledge of its program, design, or student population. I interviewed staff and students to gain, in particular, an understanding of the school's organization, culture, and milieu. I also observed teachers and students to better understand the relations among design, teaching, and learning.

A sample of my interview questions will give a sense of how the interviews were organized:

1. Questions related to ecology and organization (for teachers): How well does the school facility serve your purposes? Does the layout of the building support your teaching activities, or are you constantly adjusting your activities because of challenges related to the size, configuration, and location of school spaces? Have there been specific instances where you experienced problems using your instructional space effectively?
2. Questions related to organization and culture (for teachers): What are the three or four most important places in your school with respect to supporting learning among your students? What kinds of academic, social, and developmental needs do you see being nurtured in these places? What assumptions about teaching and learning do teachers share at this school?
3. Questions related to milieu (for students): Have you attended other high schools? What was it like there? How does it compare to this school? How would you describe the relation between teachers and students here? How would you describe the relation between students at this school? How do you feel about the school's design?

The overlap of ecology, organization, and culture is evident in the dual nature of many of these questions; some address organization and culture simultaneously, whereas others look at organization and ecology simultaneously.
The interviews provided a window into how SES teachers and students perceive, respond to, and act within their school’s physical setting (for the use of interviews in environment-behavior research, see Zeisel, 2006, pp. 227–256; and for observation, see Merriam, 1998, pp. 94–111). This information helped direct my observation of teaching, space usage, and student activity by helping me place what I observed within the context of the subjects’ experience.

I documented my observations in field notes, recording the time and location of events and (a) type of activity observed (e.g., lecture, group or individual work); (b) frequency and intensity of observed activities; (c) comments made by school occupants; (d) individual behavior and group interactions; and (e) apparent noise and traffic distraction.

I interviewed the principal, 5 teachers, and 8 students over a 3-week period. These semistructured interviews averaged about 45 min per person (usually over two sessions) and were recorded for later transcription. The responses were coded according to Owens and Valesky’s (2007) school climate model. I spent a total of 50 hr observing students and teachers, mostly during instructional periods.

I collected school documents, such as floor plans, student work, and curriculum materials, as a further source of information.

**Case Study**

The data gathered from the research is reported here in six sections. The first section, *School Context*, provides background information on the school. The next three sections show the relations among school design, teaching, and learning at SES and are divided as follows: *Ecology and Organization, Culture, and Milieu*. The fifth section examines noise and traffic distraction at the school and I conclude with a discussion of how the school’s physical design contributes to environmental education at SES.

**School Context**

SES is a Grade 11–12 coeducational public school in Apple Valley, a suburb of Minneapolis-St. Paul, Minnesota (see Figure 2). Students from the local school district can apply to SES, and any remaining places are left open to other applicants from the Minneapolis-St. Paul area. The school enrolls about 400 students each year, and its enrollment levels have been stable since the school opened in 1995. Although the school supports equity in its mandate, it recruits a cohort of students more wealthy and less diverse than the local population as a whole. Non-White students composed 8% of the school’s enrollment in 2007, and only 4% were eligible for free or reduced-price meals (internal document, November 6, 2007). However, in the local district, non-White students accounted for 20% of total enrollment, and 15% of the students qualified for free or reduced-price meals. The school’s students appeared particularly well-motivated and focused; however, whether this is a result of their entry qualities, the school program, or a combination of both is unclear and beyond the scope of the present research. SES students enjoy high levels of academic success, routinely scoring 10–20% higher than the national average on college entrance exams.

SES is relatively well-known for its interdisciplinary curriculum and the unusual design of its facility. The school regularly hosts local and international visitors who come to see the program at work or look at the facility’s architectural design. The school was recognized by the U.S. State Department as a New American School in 1998, which is a notable honor recognizing innovative whole-school reform. Interested readers can find further information about the school at SES’s Web site (www. district196.org/ses/).
The planning committee involved in developing SES's physical design intentionally fashioned the school to support collaborative teaching and an interdisciplinary environmental studies curriculum. The planning committee issued a report about its intentions at the outset: “The program design would determine facility needs, [which] is the reverse of what most often happens when building a school” (High School Options Zoo Environmental Learning Centre Committee, 1993, p. 4). The report also revealed that the school principal would have to serve as a strong advocate and protect SES's unconventional program from possible outside interference. The committee's document further indicated that teachers would be selected rather than assigned by the district, and that recruited staff would be trained in team building, authentic assessment, interdisciplinary curriculum development, and other skills related to the school's program. Overall, the report reflected an interest in tying together building design, governance, and pedagogy as parts of a systematically implemented program. The school's planners successfully staffed SES according to their original intentions. All of the program’s core elements have remained intact over the years, perhaps in part because several of the current staff members have been involved with the school from the beginning and are committed to maintaining the school's integrity.

**Ecology and Organization**

The school contains four large open plan instructional areas known as houses. Each house accommodates approximately 100 students, and there are two houses per grade. A team of two to five teachers works in each house (this number varies according to the number of students per house and whether teachers are working full- or part-time). Figure 3 shows the layout of the houses, which are located on the second floor of the two-story facility. The smaller classrooms (shown as C on the floor plan) are used for mathematics, modern languages, and other courses not part of the core curriculum. The school follows a block schedule whereby students spend a 3-hr period in their assigned house each day. The remainder of their time is spent in noncore classes, in individual study, or projects outside the school.
The two most common seating arrangements I observed in the houses were the lecture setup and the rotation setup. The lecture format follows a conventional classroom pattern in that students are seated facing the front of the room while they take notes, work individually, or engage in teacher-led discussions. Figure 4 illustrates this arrangement. Student seating is, in this case,
arranged in an A-shape, and the instructors, for example, set up a mobile whiteboard and a projection screen for a PowerPoint presentation in the central space. This arrangement is diagrammed in Figure 5.

Teachers use this format about a third of the time and tend to limit its use to 45–55 min periods to avoid monotony. Teachers usually deliver lectures as a team. Team teaching does not in itself radically alter how lesson content is sequenced. The most obvious difference, as compared with traditional teaching, is that the teachers often dialogue with one another in front of the class, either raising questions or expanding on lesson content by adding their particular insights, especially when they can bring their expertise to bear on curricular material. This dialogue, one teacher explained, is meant to model the inquiry process and show students “what a good question is [and] what a good learner does.”

Approximately another third of classroom time follows a rotation setup. In this arrangement, houses are divided into three or four groups of equal size. Each of these groups is then rotated through separate lessons so that by the end of the period, every group has been taught the same material. Temporary dividers are often fashioned out of large whiteboards so that each group is visually separated from the others. Figure 6 shows how two whiteboards are used to create three group spaces. Each lesson in the rotation setup usually spans 40–55 min, allowing the teachers to deliver a full set of lessons to each group within the 3-hr period, sometimes having time left over for a short lecture or other work. The length of each lesson must be more or less the same during a given set of rotations to ensure there is no lag between lessons.

Last, approximately one third of the instructional time is spent on group or individual work. During group work, students are clustered at tables or wherever else they can work comfortably. Students spread out more evenly for individual work. There is ample space for both these types of work.

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**FIGURE 5. Classroom lecture and seating format.**
In many ways, the instructional patterns I observed in the house setting resembled traditional teaching arrangements. Lectures, for example, did not depart greatly from conventional patterns of content presentation or pedagogic methods. Likewise, the rotation setup mirrored the traditional classroom arrangement to a large extent in that it created a physically enclosed learning environment in which the students could focus more closely on teacher-led discussion and content delivery. The group and individual work I observed also could have occurred in a traditional classroom setting. Why bother at all, then, with team teaching and an open design?

The main reason that SES teachers maintain a team arrangement is that the core curriculum incorporates life sciences, geography, history, economics, and language arts and therefore requires a range of expertise among the house teachers. A good example of how these disciplines are folded together is offered by the pond profile, a group project in which students conducted a pond study and compiled a report. The sample projects I examined contained in-depth information on the history and geography of the pond studied, in addition to chemical, environmental, and biological data about it. Township and satellite maps were used to illustrate the pond’s historical and geographical context, and numerical data were presented in charts and graphs. History, geography, and environmental biology were thus integrated in a cohesive fashion. Each teacher provided leadership in teaching the content and skills most closely related to his or her own discipline and offered general instructional support throughout the project. For example, the language arts teacher led the introductory lessons on writing reports and guided the revision process.

The open design of the house setting and extended block scheduling further contribute to the learning process at SES by providing the shared space and time necessary for extensive teacher collaboration. As the principal noted, if the school “just built four walls and had four classrooms [in each house], the learning episodes would be very, very different. It would not lend itself to interdisciplinary instruction: it would be more discipline-only and just be interdisciplinary in name
The underlying assertion here is that teachers would not collaborate to the same degree if they worked in separate classrooms or at different times. I would argue that the house space and extended instructional block scheduling actually demand collaboration among the teachers. The driving effect of the physical setting, in this respect, is most obviously reflected in the need for teachers to coordinate their use of space so that instructional activities in one area do not interfere with those in another. The extended instructional period also requires collaborative planning to ensure that lessons are properly sequenced to link together over time.

John, a house teacher, neatly summarized how instructional practice is informed by setting, scheduling, and curriculum at SES:

When you're behind the door of your own classroom, you're going to tend to do what you have been trained to do, which is to teach your discipline. When you're in a big room with two other people, . . . and you're planning your instruction with them—well, then all of a sudden you're not only beholden to yourself, but beholden to those other team-mates in other disciplines, too. . . . The building was designed . . . to encourage team teaching and interdisciplinary instruction . . . [and] it sort of forces it. I'd have a hard time if I were a close-the-door and teach social studies kind of guy. If I wanted to spend every day lecturing [on social studies], . . . I'd have a heck of a time finding a way to do that.

On the surface, it may appear that John is talking about three different things: space, teaching, and curriculum. In reality, these three elements are inextricably joined within the house context: Teachers must plan and teach collaboratively to manage the open house setting, and they must be adequately fluent in all aspects of the core curriculum so that they can provide ongoing instructional support and respond to students’ questions. Teachers are thus beholden to one another, the teaching space, and the core curriculum. This linkage ensures collaboration and makes it virtually impossible for teachers to revert to individual planning and teaching.

Culture

Team teaching presents certain challenges, which, in the absence of a shared commitment to collaboration, could lead to divisiveness among the staff. When I asked June, who teaches in one of the houses, whether there are any difficulties associated with team teaching, she said,

[There are] the same kind of frustrations that happen in any team project: the divvying up of labor, who's doing what, are people carrying their load? . . . Sorting that out, having a comfort level with that, takes a lot of work. . . . Some of the frustration I had early on was really hammering out that lesson that, on my own, I could have really controlled and directed. . . . I had to learn early on to pull back . . . [and] have that goal I was heading for, but be a little looser than I'd been in the past in terms of where it might go.

June's response not only echoed that of a number of other teachers at SES, but it is also in line with findings from studies on collaborative teaching, indicating that teachers in teams generally experience (a) some loss of instructional autonomy, (b) tension over the allocation of work, and (c) an increased need for communication because of interdependence among teachers (Graue, Hatch, Rao, & Oen, 2007; York-Barr, Ghere, & Sommerness, 2007).

The obvious way to deal with such pressures is to revert to individual teaching. However, there is an overall consensus among SES teachers that the advantages of team teaching outweigh its drawbacks. For example, several teachers stated that their loss of autonomy was amply balanced out by the benefits of interdisciplinary teamwork. Along these lines, June noted that although team teaching
involves “a shift away from your own discipline,” she recognized that interdisciplinary teaching “is not just about my things—it’s really about those [interdisciplinary] questions we’re getting at [in the curriculum].”

June, along with several other teachers at SES, additionally cited the ability to pool insights into students’ learning as a positive outcome of team instruction:

I get to have that same group of 100 students for an entire year; and I do get to know them very well, just from the amount of time [we spend together]. . . . You are there with two or three other people and they know them, and you can discuss students with your colleagues. . . . You really trust that information, [and] there is this sense of knowing that kid [and their learning needs] very profoundly.

June’s response highlights the benefits of being able to share information about students, yet it also touches on how closely teaching, setting, and scheduling are related at SES: Gaining insight into students’ learning needs and personal qualities is a matter not only of sharing information, but also of being present with students and teachers over an extended period of time. Setting and scheduling thus provide structural conditions, which, in their own way, contribute to the teaching team’s capacity to know students and understand their educational needs.

In sum, the benefits of team teaching and block scheduling provide a reason for teachers to invest in collaborative instruction, despite the tensions involved in working as a group in a shared space. This kind of incentive is vital because it constitutes the basis for a staff culture that values and supports the nontraditional practices in place at SES. Without this common culture, neither the school’s design nor its educational program would operate effectively or make practical sense. This culture is, in turn, reinforced by the design of the facility and the dynamics of interdisciplinary team teaching.

Milieu

The most pronounced difference between the house setting and the traditional classroom arrangement is that the houses are relatively large and open. This difference alone has an evident impact on milieu. All of the students I interviewed stated that the house setting is less stifling than traditional classrooms because students are less isolated from one another. Jake, for example, said,

I like it a lot better than just going to school and being in a classroom. There seems like there’s something more going on than just your class. . . . It feels more like a community, like we’re all there together . . . instead of sectioned off.

Brittany similarly expressed her appreciation for the way in which the open design facilitates a sense of social connection:

Sometimes when you’re just in a cramped, closed classroom you feel cut off from everything else.
I like to see what’s going on everywhere, and I kind of learn better that way—just knowing what’s going on, but I can still focus on my one thing.

Students universally associated being part of what goes on in their house with a sense of social membership. That is, they reported feeling far less alienated at SES than they did at their previous high school, and they largely attributed this relative lack of alienation to the house setting. Part of the environmental dynamic here is simply, as one student stated, that “you actually get to see people” on a regular basis for an extended length of time. This continued contact helps set the stage for a basic sense of community within houses.
Bob, a house teacher, offered an instructor's perspective on the social climate at SES:

As a classroom teacher with a closed door—that cottage industry thing—then you develop the culture of that classroom. . . . Every time a student walks into that room, they're adapting to that culture that teacher has created. Here, it's a little different . . . we still create those cultures, but because the space is so big and so open, the kids feel like they are more a part of the culture. You know, they can see all of these kids moving around, reorganizing and restructuring the space. They feel like it's not the teacher's culture: it's not that person up at the board, it's just the space, it's the whole house, it's what we do.

Bob's reply underscores the fact that students assume a fairly high degree of ownership over the house setting partly because there are relatively few barriers to social interaction, and partly because they are responsible for actively managing the space. As a result, they do not perceive the house as the teacher's space, but rather as a space shared by students and teachers alike.

It is worth repeating that the students' relatively high level of self-motivation plays an important part in engendering an orderly learning environment at SES. The social climate at the school certainly helps motivate the students, but they generally come to the school with an intrinsic drive to excel (a fact that was consistently reflected in the interviews). The students' motivation is evident in their work habits, their concern over grades, and the attention they devote to listening to one another and their teachers. If the students were less intrinsically motivated, the house setting would be much more unstable as a learning environment: Background noise and traffic would more easily lead to sustained distraction, as I witnessed at another open plan school with less motivated students.

Learning Distractions

Although the house setting contributes positively to the social climate, there are certain disadvantages inherent in the design. Above all, the open space does not allow for the kind of visual and acoustical control found in traditional classrooms. Careful team planning generally ensures that activities are properly spaced out and that sound levels are not excessive; however, there are limits to what planning can achieve in this respect (Ahrentzen & Evans, 1984; Cotterell, 1984). For example, when teachers lecture as a team, there is a tendency for students seated at the periphery to lose focus because it is difficult from that position to hear what is being said. I personally found it somewhat difficult to hear the teachers clearly when I was seated at the outer edge of the group. The principal corroborated this observation and mentioned he had suggested installing speakers to project sound evenly throughout the space. This idea was never taken up, however, because teachers felt that wearing a microphone would be cumbersome or awkward.

Acoustical problems also arise when the rotation format is used, because of a significant level of sound bleed between groups. Figure 6 shows the root of problem: Teachers are located in close proximity to one another, with only minimal visual and acoustical buffering provided by the whiteboards. From what I observed, the acoustic spillover is enough to occasionally interfere with vocal clarity. When vocal clarity is significantly affected (which is infrequently), student focus wanders. Teachers tend to compensate for the sound bleed by moderately raising their voices, with the end result being that quieter teachers have to exert more effort than do louder ones.

Traffic distraction poses a third occasional challenge to maintaining student focus. Most of the distracting traffic occurs when students move from one activity to another; this typically lasts about 5 min, a total of about 20–25 min per 3-hr period. Although this may seem like a considerable amount of time lost, it is in line with the time spent moving between classes and activities that one would expect to find in a traditional high school.
Overall, teachers reported that noise and traffic do not seriously interfere with teaching and learning at SES. Some teachers indicated that they experience moderate levels of fatigue and vocal strain from having to raise their voices; I also observed a certain amount of traffic distraction, mostly during transitional periods. Nevertheless, teachers plainly view the house setting positively on the whole and feel that its advantages outweigh its disadvantages. Students universally reported that they are able to tune out background noise and movement and focus on their tasks. Again, the students do their part to keep noise and traffic at a moderate level because they want to maintain an orderly learning environment.

The Facility as a Scaffold for Environmental Education: The House Setting and Outdoor Learning Spaces at SES

SES's physical design supports teaching practices that contribute directly to the school's environmental studies program. The main advantage offered by the school's design is that the layout and organization of the houses provide a scaffold for the interdisciplinary teaching that underpins the core curriculum. I do not want to digress too deeply into a discussion about curriculum, but a brief look at the benefits of interdisciplinary instruction for environmental education clarifies how SES's design facilitates learning about the environment.

First, there is an inherent fit between interdisciplinary instruction and environmental education. John F. Disinger (2001) observed, “The study of the environment necessarily involves many disciplines . . . as it is based in the natural sciences, calls for understanding societal decision-making involving the social studies, and raises value questions normally associated with the humanities” (p. 6). This kind of interdisciplinarity is mirrored in SES's core curriculum, which addresses environmental issues from multiple perspectives and integrates curricular materials from across disciplines. The previously mentioned pond profile offers one example of how students are taught to work in a multidisciplinary fashion. Although this project entails a limited degree of humanities content, it later feeds into an exploration of the historical role of water in religion and culture. The significance of water relative to human life is thus considered from perspectives grounded in the social studies and humanities (as a cultural, historical, and ethical issue), as well as from a scientific standpoint (as a water quality issue).

Further, the collaboration that is both enabled and demanded by the house setting resolves a basic challenge in environmental education: the need for teachers to have an adequate "depth and breadth of background" in the relevant disciplines (Disinger, 2001, p. 6). Disinger noted that most environmental education teachers are "prepared to be science teachers . . . or social studies teachers" and may therefore be inclined to "value and transmit less than complete, less than scientifically accurate" information because they cannot integrate all of the subject areas in an equally informed manner (pp. 6–7). However, at SES, the teachers are more or less compelled to work across disciplines as a team, which (a) requires instructors to develop competency in one another's discipline and (b) ensures that an appropriate subject-area specialist is available at any given time. Curricular depth, as well as breadth, is therefore sustained by the collaborative nature of teaching in the house setting.

The school's naturalized outdoor setting also supports environmental studies at SES. The school is fortunate to have several good outdoor learning spaces on its grounds. The most extensive outdoor learning space is the pond adjacent to the building (see Figure 7). This is where the students practice some of the skills they learned in the pond profile; they also practice plant identification. An outdoor classroom (see Figure 8) overlooks the pond. When asked about the outdoor classroom, students often recalled an early lesson on how to balance descriptive and technical writing to produce well-rounded field reports.

The outdoor learning spaces not only provide a springboard for a number of curricular units, but also play a role in nurturing a proenvironmental attitude by enabling relatively direct and sustained
contact with the natural environment. The following student comments touched on a number of positive attributes of the outdoor setting as a place for learning about the natural environment:

*Brittany:* Being close to the zoo, that’s a big deal, and so is having our own little pond that we can study at sometimes. . . . Being outdoors is better than being inside. You feel more in tune with the world, instead of being held up in some man-made structure. You’re inside Mother Nature’s
structure, I guess. It’s more comfortable that way. [Author: What does that mean?] It’s like you feel more comfortable with yourself. You’re more in tune with what’s going on around you.

Tyler: You know the weather as you’re walking in—which is nice, instead of having concrete all around you—if it’s windy, if it’s going to be rainy . . . [but] in a normal high school, it’s concrete-surrounded, a parking lot. . . . [Author: Does that fit with what you’re learning?] Yeah, it’s right next to you. We can walk out five feet and we’re there, with what we’re talking about.

Thomas: [Author: Tell me about that writing assignment in the outdoor classroom]. It’s a lot more calm . . . a lot more thought-provoking. You think about things you normally wouldn’t. If you’re stuck in a classroom, you’re not going to be like—wow, I wonder why that tree is formed around that tree, or how that vine climbed all the way up that 40-foot tree.

These students, like the other students I interviewed, drew a contrast between natural and human-made, whereby natural (or naturalized) environments are clearly preferred over and against heavily urbanized spaces. An interesting feature of the natural–urban binary here is that it connects material things, such as trees and parking lots, with emotional qualities, such as freedom and confinement. The physical setting thus takes on a metaphoric quality as a mirror for the students’ feelings about conventional school environments, which they perceive as confining and out of tune with the natural world and healthy emotional patterns. SES is viewed as a relatively calm, inspiring setting that fosters a reflective approach to observing and studying the natural environment.

Overall, the school’s outdoor setting offers opportunities for applied learning, a positive psychological environment, and a good stage for engaging students’ interests in the natural world. Thus, SES’s outdoor learning environment complements the core curriculum on three basic levels by (a) serving as a space for teaching curricular content, (b) providing a setting that helps motivate students, and (c) encouraging a sense of connection with nature.

Conclusion

SES’s design contributes to the teaching and social climate at the school, but this does not mean that the same design would necessarily succeed for all school programs or for all teachers and students. The positive effects of SES’s design ultimately rest on several conditions that are specific to the school, and this may or may not be replicable elsewhere.

One of the most important reasons the house setting works well is that the staff members have a common interest in working as teams. Without this kind of underlying culture, the tensions inherent in team teaching could lead to divisiveness—and historical evidence suggests that such friction would result in a reversion to individual classroom teaching (Beardsley et al., 1973, pp. 49–60). Therefore, SES’s open plan design functions effectively, in part because teachers are personally committed to teaching practices that are congruent with the design.

Furthermore, SES’s design operates successfully because the organization of teaching, planning, and curriculum is consistent with the house setting; collaborative planning is needed to manage the use of house space, and a diverse range of disciplinary expertise is needed to deliver the core curriculum. If the curriculum were not interdisciplinary, or if teachers did not work in teams, there would be little reason to work within an open setting. The inherent disadvantages of the open plan design, particularly the noise and traffic distractions, would outweigh its advantages.

Moreover, SES attracts a student body that is exceptionally engaged to begin with. The students are adept at maintaining focus during lectures, group tasks, and individual work periods, and are
motivated by a desire to perform academically. As the special education teacher noted, there is “tremendous” positive peer pressure at the school, and the students hold themselves and each other to a high standard. As a result, the students tend not to engage in excessive off-task social activity even though it would be relatively easy to do so in such an open setting.

In closing, ecology, organization, culture, and milieu together define environmental quality in schools. Should one of these elements be significantly out of joint (e.g., if teaching practices are poorly matched to their physical setting) then a design may falter in its intended purpose. Therefore, educators and architects should engage in the planning process with an understanding of how specific architectural designs help or hinder different educational programs. Accordingly, further research on the relations among design, teaching, and learning may give planners a better foundation upon which to build the future of school architecture.

Last, I should note that I have not attempted in the present study to posit substantive design principles because a single case study does not offer a strong basis for drawing general conclusions. Additional research is needed to address an array of essential questions, including the following: Are the dynamics related to organization, culture, ecology, and milieu highly site-specific, or is it possible to identify environmental patterns and predict environmental outcomes across different school contexts? Can open plan schools provide a suitable learning environment for students who lack academic motivation? To what extent are open settings necessary for collaborative practices like interdisciplinary team teaching? How do teachers and students perceive the use of technology in schools? Which educational technologies should be adopted as a matter of policy? Would the integration of these technologies have implications for school design?

Such complex questions extend well beyond the bounds of individual case analyses. Nevertheless, this case study represents an initial contribution to school design research, as I focus on site-specific observations rather than on design principles that can be applied on a wide scale.

NOTE

1. Bruce Jilk, a Minneapolis architect, helped develop and carry out the facilities plan. See Copa (2000) for a postoccupancy report on the school.

2. The students’ comments regarding their physical setting resonate with ecological design principles. Ecological design takes the position that most built environments divorce people from the natural world. Van der Ryn and Cowan (1996) asserted the following: “Our working days are spent in modern buildings that are sealed from the elements. Often we can’t even open the windows. Their design gives us few clues regarding orientation, climate, the sun’s position, or seasonal change. . . . It is no wonder that we literally lose some of our sensitivity toward nature. Through the daily experience of the designed environment, we learn detachment” (p. 161). It is precisely this environmental “detachment” that the students attribute to conventional school settings and which they instinctively resist. Given the students’ positive response to SES’s naturalized setting, it is evident that the school’s physical environment at least partially achieves what Van der Ryn and Cowan call an architectural “partnership with nature” (p. 162). That is, the school’s naturalized surrounding helps to reveal rather than obscure natural processes, and it brings attention “back to the wider living community . . . [and] to the change and flow of climate, season, sun, and shadow” (p. 162). Van der Ryn and Cowan argue that such a reorientation towards nature attunes “our awareness to the natural cycles that support all life,” and that “we are most alive” when we are in touch with these natural patterns (see also Orr, 1994/2004; 2002).

REFERENCES


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