

Student-Centered Sustainable Design™:

How Conserving Resources Can Also Boost Student Performance

By Michael E. Hall

Student-centered sustainable design™ has become a valuable approach that allows for the exploration of many avenues through which sustainable goals and strategies can be realized while also improving student performance, increasing teacher satisfaction, and keeping operating costs to a minimum

As a concept that continues to evolve and gain influence, student-centered sustainable design™ has refocused the perspective of many administrators and designers as they approach school construction projects. In particular, thoughtfully conceived connections with the natural environment have become vital, along with a corresponding consideration: how can schools be designed to cre-

ate a positive impact on learning while causing a minimal impact on the environment—both initially and over the long term?

School systems should also look to another ambitious goal—one that ultimately impacts both the student and the community at large. Schools today are now being designed in such a way that students can develop a deeper respect for the environment, and a better understanding of

nature at work. Accordingly, those involved in the planning and design of schools should aspire to reflect a true sense of harmony between buildings and their settings—including the land itself, the climate, and the natural resources required for facility operations.

School districts recognize that they must give careful consideration to the advantages and impact of building performance—in particular as a means of boosting student performance. At the same time, it is vital to keep operating costs low and address sustainability requirements that have become imperative today. Student-centered sustainable design™ has become a valuable approach that allows for the exploration of many avenues through which sustainable goals and strategies can be realized while also improving student performance, increasing teacher satisfaction, and keeping operating costs to a minimum.

Two examples may help to underscore the student-centered sustainable design™ approach. In the first example, a district is considering an on-site stormwater catchment and recycling system for a new school project. The cost is determined to be \$1.5 million, bringing the project over the budget at the conceptual design phase. The district's board of education must



V. Sue Cleveland High School: The new V. Sue Cleveland High School in Rio Rancho, New Mexico, features an energy-efficient façade with light shelves that shade lower window areas and transfer natural light through the upper windows into the classrooms. (Design team of Fanning Howey and Van H. Gilbert Architects)

review the situation, and consider the appropriateness of this type of expenditure as compared to preserving the school's proposed classroom daylighting scheme. A student-centered sustainable design™ approach embraces the classroom daylighting as the most beneficial expense for students.

A second example might involve the potential inclusion of a roof monitor daylighting scheme. After the scheme is designed and priced, it is determined that rising steel prices have pushed the option beyond anticipated costs. In this case, the board of education might elect to use a scheme that accomplishes much of the same intent, but at less cost. The concept of daylighting is not abandoned, only modified to meet the budget parameters.

Improving Performance

There is ample research to support the recognized connections between learning and the built environment. Mark Schneider's landmark article, *Do School Facilities Affect Academic Outcomes?*, published in 2002 for the National Clearinghouse for Educational Facilities, describes a growing body of research that documents those facility attributes that have the most impact on academic outcomes. Schneider explores seven categories:

- Indoor air quality
- Ventilation
- Thermal comfort
- Lighting
- Acoustics
- Building age and quality
- School size/class size

Those involved in school design and construction should be diligent in monitoring the results of ongoing research and look for opportunities to incorporate the findings from studies such as these into building design while maintaining the typical school construction budget.

Key priorities include the following:

Indoor Air Quality

Research clearly indicates that improved indoor air quality (IAQ) can reduce student and teacher absenteeism.

- Utilize low VOC (volatile organic compound) materials
- Provide CO2 monitoring in the classroom
- Utilize building commissioning to ensure a healthy start-up

Ventilation

Improved ventilation can minimize or reduce poor indoor air quality issues, sick building syndrome, and problems related to asthma and respiratory ailments.

- Provide operable windows
- Provide adequate mechanical ventilation for all occupied spaces
- Incorporate a displacement ventilation system

Thermal Comfort

Studies indicate that the best temperature range for learning is 68-74 degrees Fahrenheit, and that the ability to learn is adversely affected by temperatures above 74 degrees.

- Provide individual room control heating/cooling systems
- Incorporate air-conditioning, even in cold climates
- Include shading capabilities at window areas
- Incorporate a digital control system to maximize comfort levels and energy efficiency

Daylighting

There is extensive research that documents the impact that natural daylight has on student achievement and behavior. Several studies indicate that students with the most classroom daylight progress faster than those in environments receiving minimal amounts of natural

light. Those findings directly support the widespread feedback of schoolchildren and teachers throughout the U.S. when asked to cite their priorities in school facility design—responses such as “sunlight,” “daylight,” or “lots of windows and skylights” appear at or near the top of nearly every wish list. Options include:

- Attempt a good roof monitor daylighting scheme
- If budgets won't permit a roof monitor scheme, develop a window-lit scheme that is shaded and permits light to reach far into the building
- Utilize light sensors and multi-level lighting schemes to supplement the daylight while controlling operating costs and increasing lighting efficiency



At H.G. Blake Elementary School in Medina, Ohio, sound reinforcement systems amplify a teacher's voice 10 to 12 decibels above classroom noise levels.

Acoustics

As the ability to learn depends in large part on how well the brain receives incoming signals from a teacher, acoustically appropriate learning environments are critical to learning. A properly designed acoustical environment is less stressful for teachers and students and improves student behavior and attentiveness.

- Evaluate placement of buildings, environmental systems, and components such as mechanical rooms in terms of acoustical trespassing from outside sources.

For example, carefully locating mechanical decks away from academic areas can avoid unacceptable noise transfer.

- Classroom sound reinforcement systems are inexpensive (about \$1,500/room) in relation to the benefits obtained. Budget accordingly and protect this component from being omitted.
- Consider carpet in the classrooms
- Maintain the acoustical design parameters of ceiling tile and other absorptive materials in the face of value engineering suggestions to downgrade
- The latest ANSI standards for acoustics in the classroom should be considered

Physical Conditions

Studies clearly indicate that the physical condition of school facilities impacts teacher morale and effectiveness. Studies also show that there is reduced vandalism, improved relationships between students and teachers, improved motivation, and an overall enhanced learning environment as the building quality improves.

- Help communities understand the benefits of remodeling aging buildings
- Utilize low-maintenance, long-life materials and finishes
- Provide attractive, uplifting interiors
- Include exterior amenities that are user-friendly
- Provide good exterior security lighting

Small Learning Communities

Study results are also available that explore the impact of small learning communities on student performance. The goal is to connect teachers with students, and reduce isolation, violence, and an atmosphere that breeds discouragement.

- Utilize a “school-within-a-school” design to create small learning communities

- Decentralize administration spaces

Connecting to the Community

One important aspect worth considering in terms of the impact of buildings on learning is the degree to which the building can facilitate connections to the community. Many superintendents and educators have reported an increase in student motivation and a reduction in discipline problems when the community is welcomed into the facility and able to take part in a host of student programs.

Examples include facility partnerships for recreation and wellness, use of performing arts facilities, tutoring programs, distance learning, and use of school technology.

- If choosing a new site for a school, consider locations that keep students in proximity to downtown areas and central community areas, rather than remote, isolated locations
- Incorporate community rooms, with kitchens, resource areas, computers, storage, and meeting space
- Provide spaces for distance learning that are available to community members
- Zone buildings effectively so that academic spaces can be secured from public areas
- Foster creative partnerships with municipalities and community groups to share facilities and operating costs and responsibilities

Ultimately, the support of the school district in advocating student-centered sustainable design™ is paramount to its success. Many districts are framing their objectives for this approach in carefully crafted language that informs the planning and design process for each school project. For example, Dayton Public Schools in Ohio has developed the following as an important statement of the district’s vision:

“Dayton Public Schools is committed to enhancing our students’ ability to learn by providing environments that support teaching and learning most effectively. We believe the research supports school design practices that include:

- Integrated daylighting
- Improved indoor air quality
- Energy-efficient building systems
- Environmentally preferable building materials
- Improved classroom acoustics
- Design approaches that allow the building itself to be used as an instruction tool

We believe that these practices assist in providing superior learning environments, while reducing life cycle costs through conservation of energy, and we embrace these student-centered sustainable design™ practices as the most appropriate means to achieve our goals.”

This type of clearly defined policy-level support sends the right message to both the community and the design team that student-centered sustainable design™ is not just the current trend, but a vital component of educational design criteria. By using this approach creatively and comprehensively to improve the performance of educational facilities, districts will also help improve the performance of their students and teachers. ■

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