Green School Buildings as Catalysts for Sustainability Education

High-performing, green new schools and sustainable renovations promote environmental education, particularly as more school administrations embrace Education for Sustainability (EfS). EfS focuses on innovation and design for a sustainable future, with renewable energy, reduced water consumption, reduction and diversion of waste, and local food production as key themes. U.S. and international programs support and certify green school facilities that use sustainable building features to launch or grow interdisciplinary environmental education programs.
Environmental education connects students with the natural world. Education for Sustainability (EfS) builds on this connection to address how humans might exist in the natural world equitably across continents and generations. EfS is formally defined by the Cloud Institute, a pioneering non-profit for sustainability education, as “a transformative learning process that equips students, teachers, and school systems with the new knowledge and ways of thinking we need to achieve economic prosperity and responsible citizenship while restoring the health of the living systems upon which our lives depend.”

EfS green schools are designed with education as a key parameter. Green schools improve air quality, conserve water, and minimize waste; they reduce energy use by an average 33 percent and address the indoor air quality issue that plagues an estimated 46 percent of U.S. schools. Despite these benefits, green schools arguably serve an even greater purpose—they enhance ecoliteracy and launch the next generation of sustainable innovators.

Through EfS, green schools are viewed as “living laboratories,” “architecture as pedagogy,” and “green schools that teach,” in other words, spaces that will inspire and prepare students to create and maintain a sustainable environment. Green schools offer hands-on opportunities for students, such as manipulating renewable energy equipment, viewing real-time end-use electricity data, and comparing runoff on impervious and pervious pavement. Simply attending school in a green building, however, does not lead to environmental education. The green school must be combined with purposeful curricula. The following section describes four programs that promote green building design coupled with education.

Programs that Support Sustainable Schools

The Leadership in Energy and Environmental Design (LEED) Program

Established in 1993, the U.S. Green Building Council’s LEED program provides a framework for rating and certifying the sustainability of new buildings and major renovations, considering factors, including: siting of the building; building envelope; heating, ventilation, and air conditioning (HVAC) systems; water use and rainwater management; lighting and other plug-loads; indoor air quality; materials use; and waste and wastewater management. LEED assigns credits equivalent to ratings of certified, silver, gold, and platinum.

LEED offers specialized guidelines for schools, including credits for innovation around education. To receive this credit, a school develops a curriculum that incorporates the building’s sustainability features and implements it within 10 months of LEED certification. The education program must specifically address the relationship between the building, its occupants, and the natural world.

The Chartwell School, in Seaside, CA, was the first school to earn LEED platinum certification in 2006. The pre-design
visioning process, which is part of LEED’s requirement for integrative design, highlighted the opportunity to use the building as a teaching tool, exemplified by lessons that use real-time data from the energy usage dashboard system.

The Collaborative for High Performance Schools
The Collaborative for High Performance Schools (CHPS) began as a California program to promote energy efficiency of schools in 1999. It now maintains a national program for self or third-party certifying of high-performing, green schools. It has state- and regional-specific programs in California, Hawaii, Massachusetts, New York, the Northeast States (Rhode Island, New Hampshire, Connecticut, Vermont and Maine), Texas, Virginia, and Washington. As part of its mission, the Collaborative emphasizes that every sustainable school should be “a building that teaches.”

Through the Massachusetts CHPS program, schools in Maynard, Newburyport, Rochester, and other towns display educational signage about building HVAC systems and other green features. The Roger L. Putnam Vocational-Technical Academy teaches students to install, maintain, and repair the renewable energy and HVAC systems that serve the school. Other schools have solar panels, school gardens, and rain gardens near playgrounds and walkways. Students participate in recycling sorting programs that move their schools towards zero waste.

The Living Building Challenge
Launched in 2006, the Living Building Challenge is a newer framework and certification program for sustainable building design. It establishes seven performance categories, referred to as “petals,” namely place, water, energy, health and happiness, materials, equity, and beauty. Each petal has 20 imperatives, including the “inspiration and education imperative.” Performance is based on actual rather than modeled data, requiring buildings to be operational for at least twelve months. This promotes opportunities for students to participate in ongoing data monitoring.

The Bertschi School Living Science Building in Seattle, WA, was one of the first to receive Living Building Challenge 2.0 Certification in 2013. As part of the beauty petal, the design team met the request of students to include a river and abundance of plants inside the building. The school’s rain water collection system includes a pebble-lined channel running through classroom floors that is used to educate about the hydrologic cycle. The greenhouse, referred to as the Ecohouse, has a wall of tropical plants that treat the building’s grey water.

The Green Ribbon Schools Program
In 2011, the U.S. Department of Education Green Ribbon Schools program began recognizing schools that reduce environmental impact and costs, improve health and wellness for occupants, and deliver environmental and sustainability education. States nominate schools that make exemplary changes to the physical facility to improve the environment and provide interdisciplinary education about sustainability. An example of a Green Ribbon School is provided in the following section, which highlights green building features and how they might be incorporated into whole-school curricula.

Using Green Buildings in the EFS Curriculum
Green buildings are also healthy schools; they promote physical activity, limit exposure to toxins and indoor air pollutants, and deliver good nutrition. Demonstrating how a building improves student and staff wellbeing builds a foundation for ecoliteracy, in particular, when coupled with design processes and features

<table>
<thead>
<tr>
<th>Sustainable Building Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated design</td>
<td>Early involvement of building stakeholders and project consultants</td>
</tr>
<tr>
<td>Lifecycle framework for decision-making</td>
<td>Consideration of ongoing costs and environmental and health impacts, in addition to upfront costs</td>
</tr>
<tr>
<td>Low-impact deconstruction</td>
<td>Recycling of construction and demolition waste and use and construction of sustainable materials</td>
</tr>
<tr>
<td>Integration with ecosystems</td>
<td>Connection of the building to the natural world through minimal site impact and use of native plantings, incorporation of biomimicry into design, and management of rain water that enhances hydrologic cycle</td>
</tr>
<tr>
<td>Use of passive design</td>
<td>Building envelopes and ventilation that reduces energy demand and improves indoor air quality</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>Use of renewables such as solar and wind and early adoption of new sustainable energy source</td>
</tr>
</tbody>
</table>
that address additional aspects of sustainability. Specific features of green schools that teach are described in Table 1.

How are green building features used in whole-school EIS curriculum? Successful green schools that teach incorporate sustainable building features across the curriculum, using education strategies demonstrated to foster a deep understanding. These include offering opportunities for comparison of different processes and technologies; providing multiple examples and asking students to transfer their understanding to theoretical or actual new designs; working with students to engage with the community around sustainability issues; and making the buildings data easily available to students.  

At the Willow School in Gladstone, NJ, kindergarteners harvest vegetables from the school garden for a community-building harvest soup, reinforcing principles of counting and measurement. In second grade, students keep logs and graph outdoor air temperature and HVAC system energy use. In fourth grade, students map the school building and grounds with the surrounding watershed. This foundation leads to science, history, math, and writing themes that are explored in higher grades. Among other awards, the Willow School was recognized as a U.S. Department of Education Green School in 2012.

Getting Started: Green Your School

Schools from all communities and geographic settings are greening their physical infrastructure and incorporating sustainability into their curricula. The following high-level steps provide an overview of how school administrators and others in the community can get started:

1. Involve students in measuring, monitoring, designing programs, and engaging the community in changes both small and large to improve the school and local environment.
2. Know the financial facts about green schools. While they cost an estimated 2 percent (or about three dollars more per square foot), the financial benefits are assumed to be 20 times as large. Require full life-cycle decision making and consider the health and academic achievement benefits of green schools.
3. Work with a program that supports green schools, such as LEED, the Collaborative for High Performance Schools, or the Living Building Challenge.
4. Provide teachers with training to incorporate building features and sustainability themes across the curriculum. With the school as a living lab, sustainability becomes an anchor for interdisciplinary learning.

Conclusion

The process of designing or redesigning a school offers a unique opportunity to assess the stories that architectural, engineering, and landscaping features might tell students and other occupants about sustainability. To bring these stories to life and make them memorable involves engaging stakeholders in the design process, making sustainability features visible and accessible, and using the building to teach about sustainability across the curriculum. 

Allison Guerette is Campus Sustainability Coordinator at Phillips Academy in Andover, MA, and President of Lexington Community Farm in Lexington, MA. E-mail: allison.guerette@gmail.com.

References