



Bertschi Center  
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A Research  
Report

# Green Schools that Teach

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## whole-school sustainability

The incorporation of sustainability into all aspects of a school organization.<sup>1</sup>

## ABSTRACT

The combination of green school design, green organizational behavior, and aligned educational goals sets the stage for the features of green schools to become teaching tools.

Five LEED certified green schools which promote sustainability through all aspects of the school organization, including building design, operations, and curriculum were studied to explore the attributes of whole-school sustainability and to propose a framework for best practices. Shared sustainable values among stakeholders formed a supportive culture informing decisions about facility design as well as curriculum and guided the whole-school sustainability process. The physical context of participating schools reinforced successful whole-school sustainability through hands-on learning opportunities for students and physical representation of the entity's values. Alignment of sustainability values within facility and site, organizational culture, and educational program were found critical to the success in creating whole-school sustainability.

## ABOUT THE AUTHORS

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Green School Specialist, Institute for the Built Environment

Stephanie holds a Bachelors of Science in Interior Design from Oklahoma State University and Masters of Interior Design from Colorado State University. Her master's thesis centered on green school design and utilizing the school building as a teaching tool. Her research focus at the Institute for the Built Environment aligns with these topics and seeks to expand green school research and application. Stephanie is an active member of the USGBC Colorado Northern Chapter Steering Committee, the USGBC Colorado Green Schools Committee, and serves on the 2012 National Green School Conference planning committee.

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A principal with leading US/European firms since 1971, Katharine's research focuses on creativity, performance, and sustainability of the built environment. Named Most Admired Educator (2010 DesignIntelligence) for design education/leadership, she has been recognized by design awards in research, practice, and service-learning and served as Editor in Chief for the Journal of Interior Design. Her work in sustainable practices includes receipt of the HUD Award for Innovative Housing for a straw bale house to accommodate the Lakota Sioux in SD, interior architectural leader for the 1.4 million SF Tennessee Valley Office of Power, a passive solar and energy demonstration project, teaching green building study courses and the senior interior design capstone at Colorado State University.

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Brian is Executive Director of the Institute for the Built Environment (IBE) and Professor Emeritus at Colorado State University. Professor Dunbar holds two degrees in architecture from the University of Michigan and is a LEED Accredited Professional and a LEED Faculty Member for the U.S. Green Building Council. For nearly 30 years Professor Dunbar taught Interior Design and Construction Management at CSU. During his tenure, he created several successful programs including the graduate emphasis in sustainable building, two professional certification courses in green building, and sustainable design and construction courses offered in Costa Rica and on the island of St. John, USVI.

This report from a thesis submitted to the Academic Faculty of Colorado State University in partial fulfillment of the requirements for the degree of Master of Science:

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This report also draws heavily from:

Barr, S., Leigh, K., Dunbar, B., & Tremblay, K. (2011). Green Schools that Teach: Whole-School Sustainability. Greenbuild International Conference: Toronto, ON.

## STUDY JUSTIFICATION

The built environment is a physical reflection of organizations and conveys embedded organizational values to building occupants.<sup>2,3,4</sup> What if sustainability was an emanating value of the built environment of schools? Is the use of green building alone enough to communicate sustainability values to occupants?

A green facility and site, as well as the sustainable operation of the facility, have many effects on student health and learning. Studies have shown that green schools have fewer rates of absenteeism, lower turnover, higher productivity, and improved learning and test scores.<sup>5,6</sup> These statistics have made green building an obvious choice for many school administrators.

Many educational methods seek to connect students to natural environments through project-based, experiential learning; such as Environmental Education and Education for Sustainability. Studies have shown that when students learn through engaging in their natural environment, overall academic performance is improved.<sup>7,8,9,10</sup> These project-based education methods use a constructivist approach, which offers the most comprehensive theory on how individuals acquire knowledge interacting with their environment.<sup>11</sup>

Within the school organization, culture includes core norms, tradition, mission, rituals, organization, leadership, roles, curriculum, and programs.<sup>12</sup> A culture supportive and engaged in facility operations is vital to a green school's efficiency. To shift occupant behaviors toward efficient building operations, a charismatic leader with personal commitment to change is needed to formulate and articulate an inspirational vision of sustainability.<sup>13,14</sup> Collective identity, empowerment, and heightened group task performance have resulted from charismatic leadership.<sup>14</sup>

A whole-school approach to sustainability, combining a green facility and site, an educational program aligned with sustainability, and a green organizational culture, appears to set the stage for school facilities and grounds to be utilized as effective teaching tools (Figure 1).

## STUDY METHOD

The intent of this study was to conduct exploratory research in order to observe successful whole-school sustainability programs, to identify commonalities, and to develop resources including a framework of best practices and process model.

The five schools included in this study were certified under LEED for New Construction or Schools between 2005 and 2010 and were distributed by geographic location and school type (Table 1). The principals of these schools invited school leaders, teachers, parents, and community members to complete the online survey. The building professionals involved in the design or construction of the LEED certified building were also invited to participate.

The online survey used open-ended questions to collect information on school culture, school design, curriculum, and the building's use as a teaching tool. The resulting narrative responses were analyzed using qualitative methods. Statements were evaluated for patterns, categories, and themes. Statements were further organized into process categories: foundations, methods, and outcomes.

Table 1: Participating Schools

School	State	Location	Grades	Type	Enroll.	LEED Certification
Bertschi School	WA	Urban	P-5	Private	233	Gold, 2008 (Bertschi Center)
Prairie Crossing Charter	IL	Suburban	K-8	Charter	390	Gold, 2008 (Comstock Bldg.)
The Willow School	NJ	Suburban	P-8	Private	127	Platinum, 2007 (Art Barn)
Pine Jog Elementary	FL	Suburban	K-5	Public	860	Gold, 2009
Learning Gate Community	FL	Suburban	K-8	Charter	600	Platinum, 2010 (Classrooms)

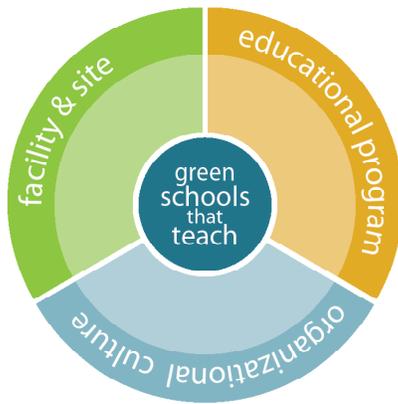


Figure 1. Constructs Framing Whole-School Sustainability

Bertschi School



The Willow School



Prairie Crossing Charter School



Pine Jog Elementary



Learning Gate Community School



## RESULTS

The online survey received a total of 77 responses, distributed between school and professional discipline as shown in Figure 2. The following quotes are representative of the most common themes found within survey responses. These statements give a clear picture of the components of a whole-school sustainability program and the process needed to develop a successful program. The following narrative organizes representative statements into thematic sections. These themes were then mapped to create a visual reference organizing the components of whole-school sustainability and the interrelationships between components (Figure 3).

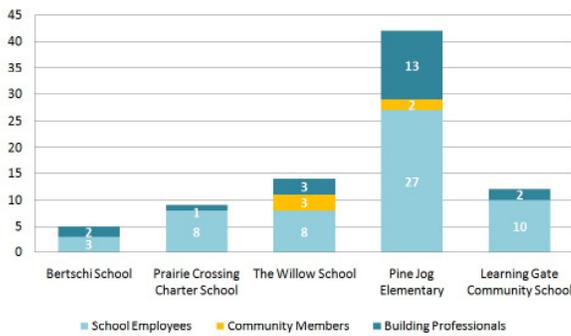


Figure 2. Response Distribution

### Culture

The most common attributes of school culture among the responses were: collegiality, the collaboration on educational issues; experimentation, interest in exploring new techniques; high expectations, a persuasive push for high performing students/teachers; reaching out to knowledge base, the use of research, workshops and experts in the community; and caring, celebration, humor, and traditions, or rituals and events supporting core school values. Participants many specific values as guiding their choice to practice sustainability. These value statements also often included a priority for student engagement and health, and financial and environmental stewardship.

*... those who value ethical behavior also should appreciate and value an ethical relationship with the natural world. This integrated, ethical approach to the natural world means that a sustainable approach to all school activities is the best and perhaps only way to truly walk that talk.*

*The principal... had a great vision for the school from the beginning. I believe the principal is a driving force for what happens in a green school building after it is built.*

*Teachers have nearly total freedom to innovate and try new lessons/activities. Leadership encourages "out of the box" ideas and projects.*

*It is a pleasure and a privilege to work at this school and know we make a difference in the environment.*

Responses displayed a universal buy-in and commitment to the schools mission, and displayed high levels of collaboration, collegiality, and sharing resources. This culture was supported by administrative commitment and high expectations, and contributed to high levels of job satisfaction.

### Facility and Site

Leadership expressed a responsibility to model high performance behavior by designing an innovative, high performing building. The integrated design process included stakeholders early in the process and appeared to help establish shared buy-in and vision, creating an environment conducive to innovative solutions.

*[We designed a green school] to set a standard for the importance of green practices for the students and families within our community at large.*

*Teachers provided perspective on program needs and what it will be like to actually "live" in the new space.*

*Students were the most valuable contributors... providing the ideas that made the building both functional and designed by and for them.*

*The architecture allows for outdoor interaction with windows, outdoor hallways, archways that pull the breeze through.*

*This focus [green school design standards] has been extended to other projects in the district and led to greening the design guidelines for all new construction.*

Indoor/outdoor connection in building design was used to reinforce curricular objectives. Exposed systems revealed building processes and allowed students to be actively engaged in the operations of their school. Monitoring systems illustrated changes in resource use, showing students their personal impact on energy use, water use, etc., and displayed economic savings to inform future building projects. Grounds and gardens were utilized to teach about "place," gave students opportunities to practice conservation, and provided opportunities for project-based learning activities.

### Curriculum

The programs of participating schools were guided by principles of constructivism, utilized active, project-based learning, guided exploration and wove sustainability into curriculum by integrated subjects and faculty collaboration.

*The big ideas of sustainability such as systems thinking, long-term thinking, interdependence, etc. are woven into the essential questions in all subject areas.*

*Students form projects based on the green technology and designs found on campus. By using our campus for learning students interact with the green designs and understand what makes our buildings special and different.*

*... whenever we can engage a student to ask "why" and to see their questions explained and answered fuels the human mind to gain further knowledge.*

Faculty promoted student engagement by allowing students to direct activities related to school operations; such as, leading building tours, managing recycling and composting, tracking energy use, and caring for the school garden.



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## CONCLUSION AND DISCUSSION

Development of green school facilities has the potential to establish or enhance collaborative cultures within schools creating forums for practicing sustainable actions, deepening occupants' understanding of how to live as environmental stewards. The physical attributes were found to be dynamic teaching tools when curriculum and culture are aligned with principles and values of stakeholders; values formed the nexus for whole-school sustainability programs. As noted by Deal and Peterson, architecture, operations, and curriculum are manifestations of shared values and beliefs .<sup>12</sup>

### Process Model

The development of the Relationship Map (Figure 3) suggested a sequential relationship between core components of participating schools' programs. Analysis also revealed fundamental attributes of whole-school sustainability programs which appeared essential in responses from all participating schools. By simplifying the relationship map into these fundamental components, a process model (Figure 4) was developed.

The intent of the process model is to assist educators, building professionals, and green school advocates in developing whole-school sustainability programs. Though this model appears consistent with the five schools included in this study, it should only be used as a guide. The process to establish whole-school sustainability will be unique to each school organization, as schools are a reflection of the ever-changing attributes of place. Necessary in the process are the core constructs – a green facility and site, green organizational behavior and an educational program aligned with sustainability. The absence of one construct is conceivable, but weakens the school's communication of sustainability to students (e.g., the absence of a green school facility). However, as a foundation of values guides the program, values will qualify future decisions (e.g., the decision to build or renovate a school using green building methods); therefore, in the evolution of a whole-school sustainability program all three constructs should develop in time.

### Findings confirm the school facility plays an important role in educational program and culture of school environments.

It is also clear shared values guide the successful implementation of the whole-school sustainability process. The use of school buildings and grounds in curriculum enhances the collaboration of designers and educators through the integration of curriculum needs into facility design and inversely, design into curriculum. When guided by a shared commitment to values among all school stakeholders, green school facilities create a critical and synergistic context for whole-school sustainability.

Figure 4. Process Model for Whole-School Sustainability

