

Charter Schools Ripe for Green Investments

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Every day, about 25 percent of America goes to “school” in schools, colleges, or universities.¹ According to the U.S. Green Building Council (USGBC), more than one-quarter of these students and teachers are in facilities considered substandard, even dangerous to occupant health. Nearly two-thirds of schools have building features such as air conditioning that are in need of extensive repair or replacement. To address this reality, a growing trend is to design sustainable or “green” schools that provide healthy and productive learning environments.²

Recent evidence points to the long-term financial benefits of sustainable schools. These benefits more than offset any initial cost premium.³ An increasing number of green schools are being built and operated for less than traditional buildings. Green schools reduce both negative impacts on the environment and ongoing building maintenance and operating costs. Specifically, efficient lighting, heating, and cooling systems, greater use of natural light and light sensors, and better-insulated walls and roofs all contribute to reduced energy consumption and costs. Reduced use of electricity and gas in green buildings leads to fewer pollutants. Rainwater catchment, green roofs, and low-flow fixtures help conserve water and reduce wastewater.

Beyond the environmental and financial benefits of sustainable facilities, indoor air quality, temperature control, lighting and acoustics have direct effects on student and teacher productivity.⁴ Green schools promote a healthy, productive learning environment, improved teacher retention, hands-on learning opportunities, and environmental stewardship. In addition, green schools can serve as examples in their communities, providing opportunities to share the lessons and rewards of sustainable development.

Financial investments in the development of sustainable schools, then, have far reaching potential effects, including:

- Increased health and productivity of students, faculty, and staff,⁵
- Reduced impact of school operations on the environment,
- Cost savings through reductions in energy and water consumption,⁶
- Opportunities for community collaboration and engagement, and
- Environmental awareness and stewardship through hands-on learning.

1 Center for Green Schools. “Initiatives” (website). Available at www.usgbc.org/initiatives/centers/green-schools.

2 According to USGBC, a green school is “a school building or facility that creates a healthy environment that is conducive to learning while saving energy, resources, and money.” See <http://www.greenschoolbuildings.org/why-green-schools.aspx>.

3 Gregory Kats, “Greening America’s Schools/Costs and Benefits: (Washington: Capital E, October 2006).

4 Ibid.

5 Ibid.

6 Green schools save, on average, \$100,000 per year primarily through 30 percent to 50 percent reductions in energy usage and 30 percent to 40 percent reductions in water usage. Ibid.

Why Sustainable Charter Schools?

A sustainable approach is a particularly good fit for charter schools. Typically, charter school missions state the importance of innovative approaches to learning and aim to achieve this goal by developing a curriculum that involves new teaching methods, emphasizes civic responsibility, promotes student and community involvement, enables effective teaching, and demands accountability and discipline. Charter schools often focus their curriculum on a common subject, allowing students to get involved in specific interests or subject matters. Promoting environmental awareness can be a natural fit for charter schools. In fact, many schools have embraced sustainability as an overarching theme for their charter.

For those seeking opportunities for impact investing, a sustainable charter school is an excellent option. High-quality educational opportunities are a critical piece in any effort to alleviate poverty, and charter schools serve a noteworthy share of students from low-income families. That is one reason investments in charter schools have become a central part of so many mission investors' strategies. These students are already at higher risk for adverse health outcomes, including asthma and obesity. Investments in school facilities that will contribute to, and not hurt or hinder, good health for students, faculty, and administrators can have a profound and lasting impact, including teaching the value of environmental stewardship to our future leaders.

This article offers a brief overview of the various design considerations a charter school will face as it plans its sustainable facility. What follows are case studies highlighting specific, positive impacts of green charter school facilities and related educational programs.

What Is a Charter School?

Charter schools are independent public schools that were first created in Minnesota in 1991 to address the decline in public school performance. Charter schools are permitted by state law to operate outside the rules and regulations that govern traditional public schools. However, charter schools may not practice selective enrollment or charge tuition. In exchange for greater autonomy, schools agree to be held accountable for the academic achievement of their students. In addition, charter schools are expected to meet the terms of their charter or face closure by their authorizing bodies.

State law determines funding for charter schools. Typically schools receive funding on the basis of enrollment—commonly referred to as “per pupil” allocations—with additional funding for special education and for special-needs students. Just 15 states and the District of Columbia offer public charter schools some amount of state facilities aid; the majority struggle to cover capital expenses from their limited operational budgets.⁷ Unlike school districts, charter schools cannot issue taxpayer-backed bonds; therefore, finding funds to support adequate facility development is a challenge.

7 National Alliance for Public Charter Schools, “Facilities” (Washington: NAPCS, 2013), Available at <http://dashboard.publiccharters.org/issues>.

Today, 40 states and the District of Columbia have charter laws.⁸ In fall 2012, 379 new charter schools opened in the United States. With approximately 6,000 schools operating across the country, charter schools represent 6 percent of all public schools and enroll more than 1.6 million students.⁹ In 2009, charter enrollment in Detroit and Washington, DC, alone climbed to more than 30 percent of total public school enrollment. Students at charter schools in New Orleans accounted for nearly 60 percent of total public school enrollment in the same year.¹⁰

Sustainable Facility Design

There are a number of primary design elements to consider when building a sustainable facility, including:

- Maximizing daylight,
- Indoor air quality,
- Environmentally safe materials,
- Energy efficiency/alternative energy sources,
- Acoustics,
- Water efficiency, and
- Waste management.

All design elements have both environmental and health impacts. What follows is a brief description of each along with evidence that supports the need to consider implementation in the nation's schools. A more in-depth discussion can be found in "The Sustainable Answer Key," a how-to manual for charter schools interested in building or renovating a sustainable facility.¹¹

Maximize Daylight

Natural light has health benefits and reduces energy costs. A 1999 study found that student performance and concentration levels improve greatly when natural light enters the classroom.¹² More recent research validated this study, demonstrating that students exposed to more daylight show a 21 percent increase in performance when compared with students exposed to the least amount of natural light.¹³ Methods to maximize daylight in classrooms

8 Ibid.

9 National Alliance for Public Charter Schools, "Growth" (Washington: NAPCS, 2013), Available at <http://dashboard.publiccharters.org/dashboard/schools/year/2013>.

10 National Alliance for Public Charter Schools, "Top 10 Charter Communities by Market Share" (Washington: NAPCS, October 2009), available at www.publiccharters.org/data/files/Publication_docs/MarketShare_P4.pdf_20110330T170229.pdf.

11 NBC Capital Impact, "The Sustainable Answer Key," (Arl: NBC Capital Impact, June 2010), available at www.nbccapitalimpact.org/wp-content/uploads/2013/05/The-Sustainable-Answer-Key-FINAL-6_24_10.pdf.

12 Heschong-Mahone Group, "Daylighting and Productivity Study" (Fair Oaks: Heschong-Mahone Group, 1999), available at: www.h-m-g.com/projects/daylighting/projects-PIER.htm.

13 California Energy Commission, "Daylighting in Schools: Reanalysis Report" (Fair Oaks: California Energy Commission, October 2003).

include clerestory windows, skylights, light wells, and reflective surfaces; shading devices; lighting control devices; light shelves; and green interior finishes.

Improve Indoor Air Quality

A recent study by U.S. Government Accountability Office (GAO) found that the air is unfit to breathe in nearly 15,000 schools.¹⁴ Schools with “sick building syndrome” (very poor indoor air quality) have greater rates of absenteeism for both teachers and students, resulting in lower productivity. In contrast, good indoor air quality is directly correlated with a better learning environment for students and working environment for teachers and staff. Good indoor air quality design minimizes the potential problems that outdoor and indoor pollutants, building materials, molds, and bacteria present. Methods of cross-ventilation and stack ventilation help ensure good air quality, for example. Proper moisture control measures can prevent bacteria and mold growth. In addition, the use of low volatile organic compound (VOC) products, including carpet, paint, surfaces, linoleum, and cleaning products, can also help ensure good indoor air quality.

Use of Environmentally Safe Materials

Beyond low VOC products, other building materials are also better for both the environment and the health and performance of students. For example, rapidly renewable materials are those that can be grown and harvested within a short amount of time. Materials such as bamboo, cork, plywood, linoleum, hemp, and wool are examples. In addition to being environmentally friendly, products like cork provide acoustic benefits and are considered a durable and resilient surface.

Schools may also consider where their materials are grown and harvested. Locally sourced materials are products made and shipped from a local area (usually within a 500 mile radius of the project site). Using locally available materials lessens the overall environmental impact of a facility project.

Finally, many products contain recycled materials or can be easily re-used or recycled after use. Items such as resilient flooring, carpet, and concrete, to name a few, can contain recycled content or even be recycled. Concrete floors are also durable and easy to clean, requiring less maintenance and cleaning products—another method of reducing waste and building green.

Energy Efficiency/Alternative Energy Sources

Energy efficiency is one of the easiest and most effective ways to lower everyday operating costs. In the average school, 10 to 20 percent of the total energy consumed is directly related to the inefficiency of the building “envelope,” or building enclosure that separates the interior

14 American Federation of Teachers, “Building Minds, Minding Buildings” (Washington, DC: AFT, 2008).

space from the external environment.¹⁵ Proper insulation of the building envelope, including exterior and interior partition insulation, double-paned glass, and control of existing building leaks, is important for both existing buildings and new construction. Frequently, seals between windows and walls need repair and are major sources of energy loss in existing structures. Efficient building envelopes can contribute to improved comfort, reduced heat loss, and reduced size and cost of HVAC (heating, ventilation, and air conditioning).

The use of alternative energy sources is another method of lowering energy use and cost in charter schools. Alternative energy sources are free, clean, and renewable sources of energy (think sun, wind, and earth) that do not negatively affect the environment. Use of alternative energy sources decreases carbon emissions and requires less dependence on finite and polluting resources like coal, gas, and oil. Although initial implementation costs may be high, lifecycle costs are low. Alternative sources of energy also provide great hands-on learning opportunities for students. Also, some schools have worked with their local energy and utility companies on lease programs (that is, power purchase agreements) to install alternative energy systems.

Acoustics

The National Academy of Sciences, which looked at the advantages of green schools in a 2006 report, noted that excessive background noise in many conventional schools impairs students' ability to learn and achieve.¹⁶ The study noted that background noise levels in many classrooms were 10 times too loud. High background noise levels in schools can affect students' memory, attention, and speech recognition and cause voice strain for teachers that may result in higher absenteeism.

Green school design minimizes noise from heating and cooling systems as well as noise from outdoor and indoor spaces. Acoustical standards for green schools ensure that a teacher's voice is clearly understood by students against any remaining background noise.

Water Efficiency

Greywater refers to all untreated water produced by a building that is not used for waste management (toilets, kitchen sinks, or related functions). Rainwater and water from sinks other than in the kitchen can be collected daily and used without treatment for flushing toilets, or filtered and used for subsurface irrigation. All unused water can be diverted to sewage systems daily. Although greywater collection systems can have high initial costs, lifecycle savings often balance initial costs over time. Re-use of water from rainfall, commonly known as storm water re-use, is a great method of saving water and reducing water costs. Water can be collected for uses such as irrigation, landscaping, and flushing toilets.

15 U.S. Dept. of Energy, "Energy Design Guidelines for High Performance Schools: Cold and Humid Climates" (Golden, CO: U.S. Dept. of Energy, National Renewable Energy Lab, June 2002), available at: [HYPERLINK "http://www.nrel.gov/docs/fy02osti/29107.pdf" www.nrel.gov/docs/fy02osti/29107.pdf](http://www.nrel.gov/docs/fy02osti/29107.pdf).

16 National Academy of Sciences, "Green Schools: Attributes for Health and Learning." Report of the Committee to Review and Assess the Health and Productivity Benefits of Green Schools (Washington, DC: National Research Council, 2006).

Waste Management

Collecting building waste properly throughout the school can be an inexpensive way to reduce costs and protect the environment. Teaching students and staff to recycle, compost, and separate waste appropriately can save on waste management and hauling costs throughout the year.

Case Studies

“Greening” a school may be as simple as implementing a recycling program, installing energy-efficient appliances, or maximizing the natural light in each classroom. A school may also choose a more holistic approach to greening its facility by pursuing Leadership in Energy and Environmental Design (LEED) certification with the USGBC. LEED certification verifies that the school has been built to meet the highest level of performance in areas such as energy and water efficiency, materials selection, and indoor air quality. In addition to LEED, other rating systems and standards include the Collaborative for High Performance Schools (CHPS), the U.S. Environmental Protection Agency’s ENERGY STAR program for rating building energy performance, and other regional programs.

The following case studies offer three examples of investing in sustainable charter schools. The case studies explore how each school incorporated nearly all of the elements listed above with health and environmental benefits in mind. Not only are their school facilities LEED certified, but the schools embody their environmental values in their curriculum, school wide waste-reduction programs and gardens. They have also engaged their students and communities by leveraging public, corporate, and nonprofit partnerships.

Thurgood Marshall Academy Public Charter High School (Washington, DC)

Thurgood Marshall Academy is a charter high school in the historic Anacostia neighborhood of Washington, DC. High crime rates, particularly associated with drug trade, have plagued the neighborhood for years as have failing schools and shuttered businesses.

Thurgood Marshall Academy was developed by a group of Georgetown University Law School students and faculty in the DC Street Law clinical program. During law school one of the school’s founders taught a course at a D.C. public high school in Anacostia. Appalled at the dropout rate for students at the school (80 percent of incoming freshman students never graduated), he made a personal commitment to provide the children in this community the chance for a better education. Shortly thereafter, Thurgood Marshall Academy’s eventual founders began searching Anacostia’s neighborhoods for a future location to start a charter high school. Eventually Habitat for Humanity helped reconstruct a vacant church school building to become the Thurgood Marshall Academy’s first, temporary home. In 2001, the Academy opened its doors to 80 incoming freshman students.

Journey to a Sustainable, Permanent Home

School leaders spent the first several years searching for a new home. Although several properties were available beyond the neighborhood, staff and faculty were dedi-

cated to serving the Anacostia community. School leaders identified a historic building, the Nichols Avenue School Building, which had been abandoned for more than 30 years. With its proximity to the Anacostia Metro station and its location at the historic gateway to the community, it was the ideal building to renovate and re-establish as a school Anacostia could be proud of.

After extensive negotiations with the City, and extensive outreach to the community, TMA purchased the building. The purchase and renovation of the facility required both financing and donations. By 2005, they had raised nearly \$6.5 million from grants, low interest loans, and an \$8 million conventional construction loan from Bank of America. In 2007, Thurgood Marshall Academy used New Markets Tax Credits, supported by a letter of credit shared by Capital Impact Partners and The Reinvestment Fund, to refinance the debt from Bank of America. Assisted by City First Bank of DC, the transaction made use of Charter Schools Development Corporation (CSDC) tax credits, with PNC Bank as both investor and leverage lender.

The decision to renovate the Nichols Building as sustainably as possible came naturally. First, for political and cultural reasons, the school's founders were committed to a more sustainable approach than ground-up construction, and therefore finding and rehabilitating an existing building in the Anacostia community was a goal. Second, it proved more cost-effective, and historically significant, to re-use as much of the existing materials as possible, leaving much of the building's original trim, floors, transoms, and skylights intact.

Finally, the schools' founders wanted the facility to be a teaching tool and students to be proud of their facility's energy-efficient systems, school-wide waste-reduction program, and organic garden. The school's Green Club has significantly reduced waste by creating and maintaining a campus-wide recycling and composting program. The Green Club maintains four raised vegetable beds for student meals when possible. The garden has also provided food for events, including the kick-off for National Farm to Schools Week and the 2013 Green Inaugural Ball. Finally, via an in-kind donation from Earth Day Network, the school installed a 2.8 kilowatt solar system on its roof in fall 2010.

A Historic Collaboration

Thurgood Marshall Academy worked with the leadership of its neighboring DC public school (DCPS), Savoy Elementary, local government, and 21st Century School Fund to modernize Savoy as a LEED certified facility. The project included the construction of a 26,000 square foot athletic center shared by both schools. In addition to LEED certification, the collaborative effort ensures that roughly 800 students annually will share one facility. This is a rare example of a charter school working directly with a conventional DCPS school on facility development from design to use. Achieving LEED certification was due, in large part, to Thurgood Marshall Academy's expertise and commitment to building sustainable facilities.

Growing Green, Teaching Green

In another collaborative effort, Thurgood Marshall Academy, teachers and leadership at Savoy Elementary, and local government worked with Earth Day Network to build an Organic Teaching Garden. The garden was constructed on Savoy's land by Thurgood Marshall Academy students through a partnership with the DC Department of the Environment and the Mayors' Summer Jobs Program. Earth Day Network donated all materials for the project. Thurgood Marshall Academy took the lead in maintaining the garden and coordinating its use by teachers and students from both schools. Although the space primarily functions as an "outdoor classroom" available to both schools, periodic joint sessions give older students from Thurgood Marshall Academy the opportunity to teach elementary school students from Savoy about ecology and gardening.

Award-Winning Success

Today, Thurgood Marshall Academy serves Grades 9-12 with 400 students, all minorities and most of whom qualify for the federal free and reduced-price meals program (a standard benchmark of economic need). The school has graduated nine classes with 100 percent acceptance rates to college, and boasts student test scores among the highest for open-enrollment DC high schools—and significantly higher than those of students in surrounding public high schools. The school has been ranked as a Tier 1 school by the DC Public Charter School Board since the inception of this rating system.

The school and its staff have received widespread recognition, including a U.S. Department of Education "Doing What Works" listing, a Coalition of Schools Educating Boys of Color COSEBOC School Award, and the 2011 Mayor's Environmental Excellence Award. The Middle States Association of Colleges and Schools granted Thurgood Marshall Academy full accreditation. Current Executive Director Alexandra Pardo received a 2013 Washington Post Distinguished Education Leadership Award, and physics teacher Kena Allison recently received a Milken Educator Award. Students have received scholarships, including Posse Foundation scholarships and the "full-ride" Stephen J. Trachtenberg Scholarship to George Washington University. Cumulative scholarship earnings among students—many of whom are the first in their families to attend college—rank in the millions of dollars.

Thurgood Marshall Academy's renovation and operation of a successful public charter school has stimulated a commercial renaissance in the adjacent neighborhood. Many formerly vacant buildings are now occupied by both public and private-sector organizations, including the Salvation Army and the DC Department of Housing and Community Development.

High Tech High (San Diego, California)

High Tech High (HTH) was originally conceived by a group of about 40 civic and high tech industry leaders in San Diego. In particular, members were concerned about the "digital divide" that resulted in low numbers of women and ethnic minority groups entering the fields of math, science, and engineering. HTH's mission is to prepare a diverse range of

students for postsecondary education, citizenship, and leadership in the high tech industry. Today, HTH operates 12 schools (five high schools, four middle schools, and two elementary schools), and serves approximately 4,700 students. Academic Performance Index (API) rankings place HTH schools among the highest achieving in the state. Virtually all of High Tech High graduates are accepted to and continue on with a college education. Of those, roughly 80 percent have received admissions offers from four-year institutions.

High Tech High North County

HTH North County opened in fall 2007 under HTH's recently awarded California Statewide Benefit Charter. Temporary facilities (modulars) were fixed on a vacant parcel to serve HTH North County students for its first two school years. Approximately \$21.7 million was needed to construct a 48,000 square foot permanent facility that would accommodate approximately 530 students in Grades 9-12. Approximately 40 percent of HTH students qualify for the federal free- and reduced-price lunch program. The North County project is located in an area with a poverty rate of 24.9 percent and an estimated median family income of \$37,943 in 2013. Using New Markets Tax Credits (NMTCs) from Revolution Community Ventures, three organizations—Capital Impact Partners, Local Initiatives Support Corporation (LISC) and RSF Social Finance—provided more than \$13 million in leveraged debt. Capital Impact Partners underwrote the entire transaction and provided nearly \$7 million in bridge financing to support the site acquisition and a short-term advance on a portion of HTH's equity contribution to the transaction. US Bank provided \$6.8 million in equity in exchange for the tax credits.

The new school building contains classrooms, specialty labs, administration offices, a commons/dining area, and support/building core facilities. Outside areas include learning patios, plazas, walkways, dining terraces, play yards including half basketball courts, green space, areas for drop off and pick-up, and parking spaces for cars and bicycles. The school was certified "LEED for Schools" Silver. The new facility includes a variety of sustainable design elements including solar panels, low-water and low-energy use fixtures, and materials with high recycled content. Specifically, in all its facilities, HTH focuses on the three primary design elements shown to have the greatest effect on student health and achievement: indoor air quality, daylight, and acoustics.

Environmental and Financial Impact

All HTH facilities are built to LEED standards and all are used as part of the learning curriculum. In fact, HTH was honored by San Diego Gas & Electric as an "Energy Champion" because of its overall approach to energy management and sustainability. The following are the specific environmental and financial benefits attributed to the sustainable features of HTH North County's facility:

- Exceeds EPA water efficiency standards by 45.4 percent, resulting in a savings of 500,000 gallons and \$10,000 in operating costs per year.
- Exceeds California Title 24 energy efficiency standards by 16.8 percent, resulting in savings of \$22,000 per year.

- A rooftop-mounted photovoltaic (PV) system generates 77,000 kWh per year, which accounts for about 10 percent of the school's energy demand on a net annualized basis.
- All core learning spaces, including classrooms, offices, and conferences rooms, are tuned and verified to exceed ANSI S12.60, the gold standard for learning environment acoustics. This is to compensate for noise reverberation and ambient background noise.
- All paints, coatings, adhesives, sealants, flooring, ceilings, and wall coverings exceed the South Coast Air Quality Management District's (SCAQMD) standards for the off-gassing VOCs. Rather than simply performing a building "flush out," HTH tested the air prior to occupancy to ensure a healthy indoor environmental quality.
- The daylight factor is greater than 2 percent in all classrooms through careful space planning and window placement. This is enough for all classrooms to operate in "Audio-Visual Mode" without any electric light sources on.

Local utility incentives and rebates offset the cost of these sustainable features, including the LEED, CHPS, and Energy Star documentation.

HTH also designs spaces that adapt and accommodate multiple uses over time. For example, the Commons is used as a theater, afterschool program, testing center, lunchroom on rainy days, and for school gatherings. Elimination or integration of systems, use of waste (recycled materials), and reduced maintenance are all methods of saving money, demonstrating a more responsible use of scarce natural resources, and ensuring HTH students, faculty and staff work in healthy environments and can perform to their greatest potential.

Since opening the NMTC-funded high school facility, High Tech High has continued to expand its presence at the campus with a middle school that opened in 2009 (its permanent home opened in 2011 and has been certified LEED for School Platinum) and an elementary school that opened in 2013 with its permanent home slated for completion in July 2014. Together the three schools now serve nearly 1,000 students and employ more than 60 staff.

Prairie Crossing Charter School (Grayslake, Illinois)

Prairie Crossing Charter School (PCCS) serves 432 students in Grades K-8 and will begin its 16th year of operations in fall 2014. PCCS is located within the nationally recognized conservation community of Prairie Crossing, and the school exemplifies the goals of the surrounding community by using the preserved landscape, prairie fields, sustainable agriculture, and natural wetlands as integral tools in the academic curriculum. Test scores consistently place PCCS among the best in the state, but the school is especially proud of its educational emphasis on environmental conservation and civic responsibility. Outdoor learning is integrated into the core subjects of math, science, social studies, and language arts, and students are engaged throughout the year in self-designed environmental service learning projects.

After initially operating out of a one-room schoolhouse, PCCS's student population quickly outgrew even the temporary modular structures and additional facility space. In 2004, PCCS used tax-exempt bond financing, along with donations from individuals and community foundations, to construct a 14,000 square foot LEED Gold-certified building. The sustainable features of the facility include:

- Nontoxic, recycled, or recyclable building materials,
- Daylight in classrooms and interior corridors (classrooms boast large expanses of glass, negating the need for electrical lighting during daytime),
- Geothermal heat pumps,
- Natural ventilation,
- Photovoltaic electricity,
- Storm water re-use (storm water is collected in large cisterns and used throughout the campus grounds for a variety of uses).

Green Inspiration

Today, the PCCS campus includes five buildings. The school's K–4th grade students are housed in the LEED-certified building, and a grassy field containing the school's geothermal system separates the elementary students from those in Grades 5–8. The building for the middle school was also built sustainably but did not pursue LEED certification process owing to budget constraints. Motivated to ensure their building was also equipped with both rain gutters and rain catchment devices, fifth and sixth-grade students, who study water and water conservation in their curriculum, designed their service learning project to develop a quasi-business to raise the necessary funds. They purchased and painted rain barrels, which they sell to the community, educating others about the importance of water conservation and re-use in the process. The students were invited to discuss and display their efforts at the 2010 National Charter Schools Conference, where they sold several additional barrels.

Community Partnerships

The school's gardening program is another example of how the facility promotes environmental health and awareness. By maintaining gardens on campus, PCCS has developed a relationship with a local organic working farm. In the "Farm to Table" program, students produce lunches for the school community using ingredients grown in their garden projects. Not only does this program teach students how food is grown, harvested, and prepared, it also teaches about the functioning of a farm business while supporting and promoting local agricultural efforts.

Both PCCS's green facility and integrated educational programming ultimately support the school's mission of teaching students to protect and preserve the environment. In fact, all eighth graders are required to complete a culminating project of identifying a pressing environmental issue and developing potential solutions.

The school has been recognized throughout the country. The Center for Education Reform awarded PCCS a National Charter School of the Year Award in 2007. In 2012, the U.S. Department of Education recognized PCCS's environmental commitment with their inaugural Green Ribbon Award. PCCS has also been recognized for the outstanding academic achievements; in 2013 the U.S. Department of Education recognized PCCS as a Blue Ribbon School, one of only 286 in the country.

Conclusion

Investments in sustainable charter schools facilitate learning opportunities, create ongoing cost savings, lower the environmental impact, and improve health. These schools not only benefit the students, staff and faculty, but also the community and environment as well.

Existing research on environmentally sustainable schools usually does not extend to charter schools, and more research is needed to more fully recognize the benefits of environmentally sustainable schools. As an example, although researchers have conducted studies of the cost premium and ongoing costs of sustainable schools, they have not analyzed the building costs for charter schools, which often vary significantly from public district schools. The latter may be required to meet more stringent design standards or pay higher, prevailing wages for labor, for example. Of the three schools discussed here, only Prairie Crossing was able to comment on a cost premium. They noted cost premiums associated with heating and cooling (6-7 percent); general construction (about 4 percent) owing to waste separation, unfamiliarity and additional reporting requirements for LEED certification, and recycled content needed for concrete; and material procurement (less than 2 percent) for specialized construction materials. By 2006, green construction was more common and Prairie experienced a notable decrease in cost per square foot for a similar set of design criteria.

We do not yet know whether demonstrated ongoing cost, performance, and health improvements of sustainable schools hold true for charter schools. Further, the three schools were not yet able to estimate the ongoing cost savings, or the academic or health benefits of their facilities. Only Prairie Crossing had some limited information from an energy group suggesting 18-20 percent less energy use on average than comparable facilities in their vicinity.

There is still much work to be done to expand the number of environmentally sustainable charter schools. However, leaders such as Thurgood Marshall, High Tech High North County, and Prairie Crossing Charter School are providing a clearer path for others to develop sustainable facilities. With access to affordable capital, more charter schools can follow in their footsteps.

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