

Introducing Green Ribbon Initiatives in Cincinnati Schools

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Abstract:

Climate change is a growing problem worldwide, with around 42% of global CO₂ emissions coming from the built environment. Education facilities like our public schools can serve as a model for environmental best practices by adopting sustainable vehicles like buses, reducing fossil fuel use in heating and cooling, constructing more light-reflective buildings, and reducing food waste. In this project, I investigated which schools in the United States are successfully adopting these techniques and which would be most easily adopted by Cincinnati. This project is ongoing, but my research found that the Department of Education has a Green Ribbon School program designed specifically for sustainability in schools. This program has been, and will continue to be, vital for helping the City of Cincinnati in their emissions reductions goals, as well as influencing future generations to explore green infrastructure.

Introduction:

The Green Cincinnati Plan (GCP), developed in 2008, has served as the City's sustainability plan to keep up with the rising temperatures, frequent storms, and other community impacts of climate change. The plan is updated every five years, making 2023's the most updated version. Since its introduction, the actions outlined in the GCP have helped deliver a 36.6% reduction in the City's carbon emissions (GCP, 2023). The GCP is composed of 8 "focus areas"; Buildings and Energy, City Operations, Community Activation, Food, Mobility, Natural Environment, Resilience & Climate Adaptation, and Zero Waste. Each focus area is composed of

strategies and action items to work towards a more eco-friendly Cincinnati, and help the City's current and future generations adapt to a changing climate.

In the area of community activation, one of the priority actions yet to be explored is the supporting of schools to model sustainable practices (inclusive of operations, buildings, fleet, and grounds) in alignment with the US Department of Education's Green Ribbon Schools pillars. Because our children and youth spend the majority of their time attending one of the City's educational institutions, it is logical to implement sustainability efforts to set a good example for them as future stewards. Given the large demands placed on educational institutions, it is important to leverage the development of green buildings and sustainability practices as passive learning opportunities, integrating sustainability more broadly and deeply in our school systems. These efforts, as well as collaborative local partnerships, could have a transformative impact on Cincinnati's next generation of leaders in a way that inspires them, challenges them, and invites them to find their own role in green solutions.

The purpose of this research is to explore the practices of green schools that make them stand out above the rest, and learn how Cincinnati could adopt them into their own school infrastructure. Throughout this paper, we aim to answer questions like: Who are best-in-class urban Green Ribbon Schools in the US? What makes them best-in-class? What factors have influenced these districts to move ahead? What similar influences do we have going in our favor in Cincinnati, and which do we not have in place and why? This research will make it more easily accessible for the Community Activation team for the city of Cincinnati to more easily implement these strategies.

Current Local Understanding:

The primary education goal for the City of Cincinnati is for 100% of their public schools to have safe and accessible outdoor learning spaces by 2028, with the strategy being to strengthen the breadth and depth of school-based environmental opportunities (GCP, 2023). Some of the recommendations outlined in the GCP already include the installation of solar panels on public school facilities, creating funding and corporate partnerships for environmental/community based education, and identifying partners to lobby the state government on sustainability issues. Though these ideas are all great in theory, they have yet to be explored in practice. When it comes to determining successful routes for green-schools in Cincinnati, we should first examine the areas that have already achieved this environmental feat, starting with those recognized with the U.S. Department of Education's Green Ribbon.

Examining Nationwide Programming:

The U.S. Department of Education Green Ribbon Schools (ED-GRS) is a public engagement initiative for school sustainability that is structured as a federal recognition award (ED, 2024). Created in 2011, the award aims to celebrate the various schools, districts, postsecondary institutions, and early learning centers that have implemented cost-saving, health promoting, and performance-enhancing sustainability practices.

The ED forms its definition of a green school based on three pillars:

1. Reducing environmental impacts, such as waste, water, energy, greenhouse gases, and transportation, encompassing the areas of school facilities, grounds, and operations
2. Improving health and wellness by promoting a healthy physical environment (including aspects such as air quality, contaminant control, moisture control, pest management, daylighting, and acoustical and thermal comfort) and student and staff wellness practices (such as healthy school food and outdoor physical activity); and

3. Offering effective environmental and sustainability education, including civic learning, green careers, and STEM connections (ED, 2024)

This way, instead of identifying a school as “green” based solely on green infrastructure or nature-based education, they must encompass all three to be awarded. Each year, state education officials nominate their top schools based on their successful inclusion of all three pillars, and the award is given to the honorees. Each institution can only be awarded once, but it is never revoked, so schools are encouraged to upkeep their environmental practices.

Last year, 41 institutions were honored with the Green Ribbon Schools award, including 24 disadvantaged public schools, three non-public schools, two charter, two magnet, 11 districts, and 4 institutions of higher education. The state of Ohio was one of the few states to not receive a GRS award in 2023. In section, we will highlight some of the institutions awarded the GRS in 2023, so that we can draw on the most recent ideas for green school infrastructure and education practices.

One example of an elementary school that received the GRS award includes Jefferson Elementary school in California. 54% of the 448 students at Jefferson are free-lunch eligible, speaking to the economic disparities amongst students. Still, the California school was able to replace heating, cooling, lighting, and water systems to increase their energy efficiency and conserve resources, resulting in a 14.1% reduction in energy use from January 2020 to January 2022. They are also known from their native and drought-tolerant landscaping, which is vitally important in a drought-ridden state like California, but will become more important nationwide in the year to come as well. For education, the school has programming that provides students with weekly nutrition and cooking classes, free of extra charge.

One of the largest public school systems in the Northeast, Boston Public Schools (BPS) in Massachusetts, holds 48,777 students across 119 schools in 132 buildings. As a city agency, BPS follows the City of Boston's 2019 Climate Action Plan. One of their largest environmental feats has been the BPS Transportation system, which will only purchase electric buses when buying new buses, instead of diesel or propane. The city has plans to transition to a fully electric fleet within the next 10 years.

Looking at higher education, last year the GRS recognized Purdue University in Indiana. With 38,000 students, Purdue was one of the larger institutions recognized. In 2020, the University launched a Physical Facilities Sustainability Master Plan that consists of 13 actionable and measurable goals across five major categories: energy, water, materials, buildings, and grounds. Despite growing the size of their campus by more than 2.3 million square feet from FY 2011 to FY 2022, they were still able to reduce domestic water use by 27% and its energy use intensity by more than 10% over the same time frame. Similar to Burnett Woods in Clifton, Horticulture Park, located next to campus, is a 24-acre forested park that provides a vital space for outdoor physical activity and serves as a "living laboratory" for applied student learning in ecology and forestry. On campus, Purdue has planted 1,882 trees in the last 3 years, putting them in Tree Campus USA for the 13th consecutive year.

Another smaller, but well-recognized institution awarded was West Chester University in Pennsylvania. According to the GRS 2023 report, WCU has cut energy costs by millions of dollars, lowered per capita carbon emissions by more than a third, and significantly reduced the environmental impacts of its campus operations since 2010. Their large geo-exchange heating and cooling systems allow energy efficient, low carbon temperature control in over 40% of campus building space, and their ground and roof solar arrays also contribute to their admirable

green infrastructure. On a smaller scale, custodial services purchase janitorial paper products from certified sustainable paper sources and over half of cleaning products from green certified products vendors.

The last awardee in Cincinnati was in 2021, and was Gamble Montessori High School. Located in the heart of Cincinnati on a 14-acre campus, Gamble is a prime example of a Cincinnati Public School-turned-green school with the right fund allocations and renovation efforts. Now, the school is a first-place winner of the ASHRAE technology award for energy-efficient buildings. This includes a state-of-the-art building automation system to ensure fresh air circulation (which became especially important during the COVID-19 pandemic), occupancy sensors and LED lighting help to save energy, low-flow toilets and faucet sensors reduce water waste, and more. More small-scale initiatives include providing a water bottle made from 100% recycled plastic to each of its 608 students, an organics recycling program, and purchasing only non-toxic cleaning and paper supplies.

For environmental education efforts, the campus includes four outdoor classrooms and an extensive land lab with a maple grove, arboretum, spring bulb garden, permaculture orchard, raised beds for edible plantings, and kitchen herb garden. Every aspect of the school garden and orchard is maintained by students in all grade levels. A health and wellness committee is also active at the school, and has organized organic food options and runs employee wellness programming. Student dining services partners with local growers, sourcing 90% of milk and 30% of produce from local farmers.

The environmental science curriculum covers a wide range of topics from biodiversity and ecological relationships; food production; water, air quality, and pollution; climate change;

and human impacts on environmental systems to politics, ethics, and social justice. Apart from their own coursework, students partake in community science and are encouraged to write letters to policy makers, developing early skills as environmental advocates.

The efforts of Gamble Montessori show us that this work is achievable for all Cincinnati schools, we need only to look to institutions like these and prioritize relationships with local partners to make it happen.

Recommendations

Looking at the accomplishments of schools awarded the GRS both last year and in the years before, there are a few key areas we can draw from for inspiration and action plans to develop more environmentally friendly, sustainable schools. This section breaks down recommendations for each area, including buildings, vehicles, food, justice, and education.

Buildings:

A primary consideration for green school infrastructure are the school buildings themselves. Sustainable school development can not only fundamentally alleviate the environmental impact of building energy, but also reduce and eventually eliminate the negative effects of buildings on human health and the environment. Numerous studies have supported that physical condition of the school is significantly correlated with student learning and academic performance & outcomes, and the condition of school facilities has a significant impact on student performance and teacher effectiveness (Zhang, 2020). In the USA, K-12 schools represent approximately 8% of the energy use and 10% of the floor area in-service buildings nationwide, spending more than \$8 billion each year on energy (U.S. Department of Energy,

2013). Many public school buildings in the greater Cincinnati area are old, with a lack of green technology to help them reach standards laid out by the ED. Public schools face a large issue when it comes to proper funding for these renovations, so that will be key when it comes to implementing these strategies.

Milwaukee Public Schools, as a prime example, had to come together with generous funders and community partners to proceed with a multimillion dollar investment in Milwaukee schools and neighborhoods. Potential improvements will include installation of bioswales to manage storm water, the addition of outdoor classrooms, more tree plantings, and creation of areas to serve as school gardens. Their anticipated fundraising needs are \$3.4 million, with approximately \$1.7 million raised to date. School systems like Milwaukee are utilizing their relationships with local partners to help make this happen. There is an equivalent for nearly all of these partners in Cincinnati, including the Metropolitan Sewer District (MSD), Devou Good Foundation, Keep Cincinnati Beautiful, Great Parks, Cincinnati Nature Center, and more.

Before construction begins, the City of Cincinnati will need to do a comprehensive assessment of each of the 66 public school's current infrastructure and environmental impact. With the help of environmental and civil engineers and consultants, we can develop a detailed plan outlining the specific green initiatives to be implemented in each school, such as energy-efficient upgrades, water conservation measures, waste reduction programs, and green spaces development. The anticipated projects in Cincinnati public schools include (but are not limited to):

- Install energy-efficient lighting systems, HVAC (heating, ventilation, and air conditioning) systems, and appliances to reduce energy consumption and lower utility costs.

- Install automated lighting and temperature controls, to optimize energy usage.
- Install low-flow faucets, toilets, and showers to reduce water usage and minimize wastewater generation.
- Implement rainwater harvesting systems to collect and reuse rainwater for irrigation and other non-potable purposes.
- Incorporate green stormwater management practices, such as permeable pavement and rain gardens, to reduce runoff and improve water quality on school grounds.
- Establish recycling programs for paper, plastic, glass, and other recyclable materials throughout the school facilities.
- Create outdoor learning spaces and make buildings with green roofs and vertical gardens to reduce urban heat island effect and improve overall air quality.

Once there is a more measurable goal based on the necessary audits and environmental impact assessments, we can move forward to seek funding from project partners.

Vehicles:

According to the American School Bus Council, there are over 480,000 school buses in the United States, which transport 26 million children to school and result in 5.76 billion mi of travel per year (American School Bus Council, 2011). Though vital to the functioning school system, school buses in the United States still consume 822 million gal of diesel fuel annually, and school transportation costs can account for a significant portion of resource-constrained school district budgets. As they exist now, they are detrimental to the environment. However, there are solutions that have been explored in other states.

One study in Vermont compared a plug-in hybrid-electric school bus to a conventional school bus using an on-road emissions tester over a 32-km route. It was estimated that the hybrid-electric school bus consumed 28.7% less fuel than a standard diesel school bus. It was also reported that NO emissions were 49% lower for the hybrid-electric school bus than for the conventional school bus, CO emissions were 72% lower, and HC emissions were 49% lower (Garabedian, 2010).

President Biden's Bipartisan Infrastructure Law provided the EPA with \$5 billion between FY22 and FY26 to replace diesel school buses with low-and zero-emission alternatives. In May of 2022, the EPA awarded \$965 million in rebates to 400 school districts for over 2,500 new clean school buses (MENA Report, 2023). This kind of incentive could be beneficial for Cincinnati when replacing our fleet with green, electric buses.

The association that represents all U.S. investor-owned electric companies, Edison Electric Institute (EEI), and the Beneficial Electrification League (BEL), a non-profit organization that works closely with rural electric cooperatives and public power utility providers on electrification initiatives, have joined with EPA to pledge their support for school bus electrification.

For Cincinnati Public Schools specifically, steps to be taken include:

- Conducting a comprehensive fleet assessment of the existing school busses to determine the age, condition, and emissions levels of each vehicle across each district. Consider the replacement of older, less fuel efficient vehicles with electric, or at least newer ones
- Investing in alternative fuel technologies such as propane, compressed natural gas (CNG), or electric buses as opposed to diesel.

- Electrification of the fleet with electric buses, working to install charging at bus depots and school parking lots and explore funding through the EPA and other state and nationwide programs.
- Implement route optimization strategies to reduce mileage, idle time, and fuel consumption (GPS and GIS tracking systems)

Food:

One huge environmental issue that is often overlooked is that of food. Food sourcing, consumption, and waste all play a vital role in a healthy student population and a more sustainable school infrastructure. Food waste is a significant issue in the United States. The United States Department of Agriculture (USDA) estimates that over one-third of food produced is being wasted annually, which equates to 133 billion pounds and USD 161 billion (Gunders, 2012).

One study from the British Food Journal called “primary school children’s responses to food waste at school” actually explored how children themselves respond to food waste, and revealed what they view as solutions. Findings indicated that children actually have a clear understanding of the consequences of food waste for individuals, society and the environment. They displayed negative emotions concerning food waste and responded positively to the possibility of food composting. Their solutions for food waste, rather than relying on intervention schemes that require significant adult involvement, placed a heavy emphasis on self-regulation, playing an active role in addressing food waste in school. Often being picky eaters themselves, children are often large contributors to food waste. But with proper education, schools can help them see the consequences of their actions, and encourage them to only take what they plan to eat during school meals (Yen, 2022).

Existing literature attributes the cause of food waste in schools to broad categories defined as: food-related (palatability and accessibility); child-related (taste preferences and satiation) and programme-related (duration, food service policies and coordination) (Blondin, 2015). Palatability refers to the taste, flavor, and overall appeal of the food served in school cafeterias. If the food does not meet students' preferences or expectations in terms of taste, texture, or presentation, they may be more likely to throw it away without consuming it. Practical solutions for this could look like expanding a broad palate of delicious and nutritious food in our school cafeterias. Accessibility relates more to how easily students can access and consume the food. For example, if healthy options are not readily available or if there are long lines or limited time to eat, students may be less likely to consume their meals, leading to increased food waste. Simple solutions to this could look like creating more lines with different options for students, and helping them be knowledgeable about the nutritional content of the food that they're eating. Program related solutions could be extending mealtimes for students to be present with and enjoy their food, as well as implementing waste reduction strategies.

One study on food waste reduction in schools aimed to assess change in school-based food waste after implementing the Smarter Lunchrooms Movement (SLM) with school food service workers. The Smarter Lunchrooms Movement (SLM) is a nationwide initiative in the United States aimed at promoting strategies to encourage healthier eating behaviors among students in school cafeterias. The movement was launched in 2009 by researchers at the Cornell Center for Behavioral Economics in Child Nutrition Programs (BEN Center) in response to the rising rates of childhood obesity and concerns about the nutritional quality of school meals. Results showed that small adjustments like menu variety, encouraging healthy eating behaviors, and cafeteria design showed a significant reduction in food waste (Elnakib, 2021).

Food waste aside, a lot of cafeteria food is not sourced locally, and rather from large food corporations without as much nutritional value. Initiatives to get local food in cafeterias include Farm to School (F2S), a wide range of programs and activities designed to change food purchasing and education practices of schools. Although F2S differs among schools, it always includes at least one of three core elements—procurement, education, and school gardens (National Farm to School Network, 2021). Procurement involves purchasing, promoting, and serving local foods in school cafeterias, at mealtimes, or as snacks/taste-tests in classrooms. F2S can benefit not only the nutritional health and education of school children but also the economic viability of local, small farmers (Thomson, 2023). Other helpful tactics to get kids more interested in food sustainability and where their food comes from include school gardens and career days from local farmers and food sellers.

For Cincinnati specifically, actionable items for increasing food sustainability in schools include:

- Working with local food partners like Greenacres, 80acres, Turner Farm, and others to fill cafeterias and school meals with fresh, seasonal ingredients.
- Host career days with local farmers and sustainable food establishments.
- Use school gardens to grow fruits, vegetables, and herbs on-site, providing students with hands-on learning experiences and increasing access to fresh produce.
- Develop menus that emphasize plant-based and organic foods that will taste and look appealing to students.

- Educate students on the importance of nutrition and food waste as it effects the environment they will grow to adopt.
- Implement composting programs to divert food scraps and organic waste to the local farms and businesses we work with.

By implementing these strategies and fostering a culture of sustainability within Cincinnati Public Schools, the district can play a leading role in promoting healthier, more environmentally responsible food systems and empowering students to make informed choices that support their well-being and the health of the planet.

Justice:

It is widely known that there is a strong intersection between the home, neighborhood, school, and workplace when it comes to student and staff well-being. Cincinnati has a large population of underprivileged youth. Often minority students, struggling with broader systemic issues in the home, and health crises related to the environment and pollution of Cincinnati. Ensuring environmental justice in Cincinnati public schools has a responsibility to address the disparities in environmental quality, access to resources, and exposure to environmental hazards among our diverse communities.

Previous environmental justice research has focused on analysis of the disproportionate burden of environmental hazards on minority residents; few studies have examined demographic inequities in health risks among children. One article from the Social Science Quarterly evaluated the demographic distribution of potentially hazardous facilities and health risks associated with ambient air toxics exposures among public schoolchildren in the Los Angeles Unified School District. The study combined GIS analysis with multivariate statistics to compare

enrollment and demographic information for students who attend district schools with the spatial pattern of land use, locations of toxic emissions and facilities, and calculated indices of estimated lifetime cancer risk and respiratory hazards associated with exposures to toxic air emissions. Results indicated that the district schools in Los Angeles are more likely to be located in census tracts containing potentially hazardous facilities, and that minority students (especially Latinos) are more likely to attend schools near hazardous facilities and face higher health risks associated with outdoor air toxics exposure (Pastor, 2002).

The location of schools near potentially dangerous areas with hazardous pollutants is not confined to Los Angeles, many large city school districts are also seeing these effects. One study examined the public K-12 schools in Sacramento from an environmental justice perspective, and found that PM25 emissions from road traffic affecting a school site are significantly positively correlated with the percent share of Black, Hispanic and multi-ethnic students. If that wasn't frightening enough, the emissions metric correlates negatively with the schools' Academic Performance Index, the share of White students and average parental education levels (Gaffron, 2015). There have been some criticisms of EPA's guidance, particularly for its reliance on reducing, rather than avoiding the effects of environmental hazards and its lack of awareness around racial segregation issues, and Cincinnati is not an exception.

Actionable steps the City of Cincinnati can take to make sure public schools are equal in terms of environmental justice include:

- Ensure students, especially those in marginalized communities, have equitable access to different school resources, including scholarships/funding, facility use, and educational opportunities.

- Evaluate schools built in low income areas of Cincinnati and do environmental assessments to make sure the air, water, and building quality is in line with regulation. Keeping an eye out for mold, lead, and other pollutants common with older buildings.
- Foster partnerships with local community organizations, environmental justice groups, and advocacy networks to amplify community voices, particularly those of color and other minority groups, to prioritize environmental justice.
- Involve students, parents, teachers, and community members in decision-making processes, planning efforts, and environmental initiatives to ensure that their perspectives and needs are represented and valued.
- Incorporate environmental justice and sustainability topics into the school curriculum to provide students with a comprehensive understanding of environmental issues, social justice, and civic engagement.

Education:

Lastly, but potentially most importantly, Cincinnati schools need to prioritize environmental education in their school curriculum. To develop environmental solutions, the next generation of problem solvers will require an understanding of these relationships between our natural and built environments (National Council for Science and the Environment, 2003). An Assessment of Certified Sustainably K-12 Schools in the United States published by the Journal on Environmental Education highlights three interconnected metrics by which we can conceptualize successful environmental education

They are:

1. *Curriculum*: projects focus on classroom activities, teacher/student interaction, content and class programming, professional development and training, etc.,
2. *Campus*: projects relate to school and school district operation, which include staff and administration practices, physical facilities, school grounds and open space, operation and maintenance, etc., and
3. *Community*: projects focus on a school's wider influence and partnership including parent participation, collaboration with the business community, interaction with government and non-profits or NGOs, (non-governmental organizations) etc. (Warner, 2015)

Warner argues that the interconnectedness of environmental sustainability programs at K–12 schools is one metric by which sustainability education can be conceptualized, presenting a measure of whole-school sustainability, or “interconnectedness,” and then using it to compare to the GRS award. This essentially looks like tying in each aspect of coursework to environmental issues, creating well rounded students who are knowledgeable about the natural world and the issues it faces. Increasing the breadth of environmental education in Cincinnati's public school system will mean incorporating environmental concepts into the curriculum, providing hands-on learning experiences for students, and fostering a culture of environmental stewardship among students, teachers, and the community. Action items for broadening environmental education in Cincinnati schools include:

- Working with project partners like Groundwork Ohio River Valley and Imago Earth to come and speak with students about environmental advocacy and issues happening locally

- Incorporate environmental education across various subject areas, including science, social studies, language arts, and math, to provide students with a holistic understanding of environmental issues and their interconnectedness with other disciplines.
- Professional development opportunities for teachers to enhance their knowledge and skills in environmental education lesson plans, curriculum design, and interdisciplinary teaching methods.
- Offer hands-on learning experiences, field trips, and outdoor education programs that allow students to explore local ecosystems, conduct scientific investigations, and engage with environmental issues in their community.
- Establish partnerships with local environmental organizations like Cincinnati Nature Center and Great Parks to provide students with access to outdoor learning opportunities and environmental education resources.
- Create school-based environmental projects, such as school gardens, habitat restoration initiatives, and recycling programs, that empower students to take action and make a positive impact on their school environment and community.

By implementing these strategies, the districts can help prepare students to become informed, responsible, and active citizens who are equipped to address environmental challenges as they mature, and contribute to a more sustainable future for their community and the world.

Conclusion

The implementation of green infrastructure within Cincinnati's public school system represents a significant step towards fostering sustainability, environmental awareness, and

equity within education. By aligning with the goals of the US Department of Education's Green Ribbon Schools Award, the educational goals in the Green Cincinnati Plan can be effectively reached. Between initiatives for sustainable redevelopment, such as building renovations, vehicle upgrades, food waste reduction practices, and environmental justice considerations, Cincinnati's schools will be en route to become models of environmental stewardship and educational excellence.

Through these efforts, students not only benefit from healthier learning environments, but also gain valuable insights into the importance of conservation and environmental justice, preparing them to become informed and proactive global citizens. However, it's essential to recognize that achieving these goals requires ongoing commitment, collaboration, fundraising efforts, and community engagement to ensure that the benefits of the GCP are sustainable in the long term. As Cincinnati continues to prioritize greener initiatives in its public schools, it sets a powerful example for communities nationwide, demonstrating the transformative potential of integrating environmental sustainability into education.

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