

RESEARCH ON DEVELOPING A MODEL FOR A PILOT 'GREEN' SCHOOL IN THE CITY OF LOWELL

Submitted by: David Turcotte and Julie Villareal
Center for Family, Work, & Community (CFWC)

August 1, 2003

Introduction

During this research project, we investigated innovative strategies to achieving the goal of creating a 'green' school in the city of Lowell in an effort to incorporate sustainability into the K-12 curriculum. Our interest in this area came out of involvement with teachers, parents, members of the cultural community, a local farmer, community neighborhood groups, university faculty and staff, and city officials around developing a pilot 'green' school at the Rogers Middle School.

Concept of a 'green' school

During the course of our research, we discovered a number of models and definitions of 'green' schools that we considered incomplete when taken individually. Consequently, we developed a concept of a 'green' school that combined facets of the individual models into a more comprehensive and integrative approach. The facets that we believe should be incorporated into a 'green' school are:

1. Energy and water efficient, including alternative energy usage
2. Environmentally conscious utilizing a lifecycle approach in design, building materials, ongoing practices, and budgeting
3. Healthy learning and working environment
4. Sustainability, hands-on, and service learning incorporated in to curriculum

We believe that everyone benefits from having a 'green' school. Students benefit from the hands-on lessons in recycling and composting that will pay off now and in the future. They will learn at an early age the importance of how we live in a world of very finite resources and the reasons and methods for planning their sustainable future. Taking the lifecycle approach, the school benefits from long term cost savings. It also benefits from having a clear mission that leads to a more motivated and unified staff and student body, including outreach to the community. Students and staff benefit from a healthier school environment with cleaner air and less asthma attacks, no mold problems, alternative cleaning products, healthier building materials, and reduced pests and allergens. Parents benefit from knowing that their children are learning in a healthy environment. Communities benefit from the partnerships established among the many stakeholders that ensure this institution will remain healthy and environmentally friendly in the future. And last, but not least, the environment benefits by the reduction of polluting fossil fuels and other potential contaminants (Green Schools: Using Energy Efficiency to Strengthen Schools p. 1).

Not only will the students benefit from a healthier school environment, but also consciousness can be raised about nutrition and exercise in the curriculum as well as in the cafeteria, as we believe that unhealthy food undermines a healthy school environment. Students will learn about healthful, low-fat, low-sugar choices as opposed to processed foods and also learn where food comes from. Students can learn that food doesn't originate in the supermarket, but on farms where food grows on trees, on vines and bushes, and under the earth. A federal grant program exists that is part of a nationwide movement to encourage schools to buy local organic produce,

thereby encouraging regional sustainability, This program also encourages children to visit local farms and see first-hand how food is grown and comes amid a growing epidemic of childhood obesity. The number of overweight children ages 6 to 11 years of age has doubled in the last twenty-five years – the average eleven year old today weighs 11 pounds more than in 1973 (New York Times. September 4, 2003).

Case Studies

As we lacked a concrete model and approaches to achieving the common goal of creating a ‘green’ school that incorporates sustainability into curriculum, service learning, and the school building itself, we looked at practices used at other schools throughout the country to develop a ‘best practice’ guideline that will help guide the creation of a ‘green’ school in the city of Lowell.

The case studies that we researched, the majority of which are urban, are:

Massachusetts	-	1)	Somerville
		2)	Burlington
		3)	Waltham
		4)	Chicopee
Oregon	-	5)	Portland
		6)	Redmond
North Carolina	-	7)	7 case studies

- 1) The city of **Somerville**, MA. built a **new** 560-student, pre-kindergarten through 1st grade early education center. They hired a design team and used energy modeling and research early in the design process to explore opportunities to improve the building’s performance. The building is deemed a ‘high performance school’ designed not only to optimize the integrated performance of building components to achieve more energy efficient goals, but also to consider the impact of the built environment on the educational performance of the students. This **urban** project focused on the **building** and emphasized environmentally responsive site planning (native species plantings on the site, community gardens, underground infiltration/detention field to store rainwater), daylighting, high performance electric lighting, energy-efficient building envelope, high performance HVAC, renewable energy, environmentally preferable materials and construction process, indoor air quality, thermal comfort, acoustics, and water/sewer efficiency.
- 2) The city of **Burlington**, MA. compiled an extensive review of environmental, health, and safety (EHS) issues involving this **urban** city’s public school system. The city wanted to identify concerns relating to EHS and to take action to correct the problems within the school **buildings**. Areas that were covered include: chemical management and usage, asbestos management, indoor air quality, pesticide usage, mercury management and exposure prevention, radioactive materials, fire prevention, pollution prevention, hazardous waste generation and management, formaldehyde, radon, chemical fume hoods, eye washes and deluge showers, safety equipment, hazards, spill and emergency response plans, ceramic kilns, underground storage tanks, lasers in the classroom, and discharges to the sanitary drain.
- 3) The **Waltham Public School** system implemented an Environmental Management System (EMS) based on ISO 14001 international standard. The EMS at the Waltham Public Schools is believed to be the first of its kind in the Commonwealth of Massachusetts and may be used as a model for other communities. Each of the 13 schools has assigned two staff members to serve as School Environmental Coordinators. Key components to the EMS for this **urban** school **buildings** include:

- environmental policy, chemical management, indoor air quality, waste management (recycling and improved solid waste storage), water quality/conservation, energy conservation (incorporating natural day lighting in the design of new schools), toxics use reduction and pollution prevention.
- 4) **Chicopee** School District endorsed the Environmental Protection Agency's (EPA) "Tools for Schools" kits (that focuses on **indoor air quality**) for implementation in two of its schools: Streiber Elementary school and the Chicopee High School.
 - 5) The Harold Oliver Primary School in **Portland** is one of the nine schools in the Green School District in Oregon. Resource Conservation Teams meet monthly and focus on **reducing waste and recycling**. The program **involves students** who pick up and monitor paper recycling, milk and juice carton recycling, and polystyrene plate and plastic utensil recycling. The 'reduce, reuse and recycle' themes are incorporated into **curriculum**. In 2000, the school established a **vermicomposting** program where red wiggler worms feed on lunch-time fruit and vegetable waste. They use the vermicompost in their Global Garden – a large student-planted garden representing many areas around the globe.
 - 6) The Hugh Hartman Middle School in **Redmond** has been a 'green' school since 1998 and continues to expand and improve its recycling program. **Students participate** in the program and spend about 3 hours per week completing their recycling duties. The school has a Bicycle Repair Shop program and a Worm Composting Program that has reduced lunch waste by 10-15 pounds per week.
 - 7) Seven of the North Carolina Schools, from various regions of the state, implemented a **waste reduction program** comprised of waste prevention, recycling, reuse and composting (and vermicomposting) efforts. The program was put into the curriculum and was a very **hands-on student** program.

Tool Kits

During our research, we also studied various Toolkits that exist for creating a 'green' school. They are as follows:

1. Education for Sustainable Development Toolkit – local educational systems can reorient existing curriculums to reinforce local sustainability goals
2. Integrated Pest Management Toolkit
3. Oregon Green School Tools – Creating Healthy School Environments through Resource Efficiency
4. DEP Manual for Implementing School Recycling Programs
5. Collaborative for High Performance Schools – Best Practice Manual
6. Daylighting in Schools Toolkit
7. Indoor Air Quality Toolkit
8. A Citizens Guide to Ensure Pesticide Use Reduction in Massachusetts

1. The '**Education for Sustainable Development Toolkit**' (ESD) is an easy to use manual that helps communities get started in the business of educating for sustainable development. The ESD toolkit is based on the idea that communities and educational systems within communities need to dovetail their sustainability efforts. As communities develop sustainability goals, local educational systems can modify existing curriculums to reinforce those goals. The ESD toolkit shows a distinction between education *about* sustainable development and education *for* sustainable development. The first is an awareness lesson and the second is the use of education as a tool to achieve sustainability. The 142 page toolkit explains what ESD is, outlines the process of improving basic education, acknowledges the challenges and barriers to ESD, and presents a Case Study (Toronto Board of Education).

2. The **Integrated Pest Management (IPM) Toolkit**, published by the Massachusetts Department of Food and Agriculture, describes the process for implementing an integrated pest management program in your building. The IPM is a common sense approach to pest management that uses a variety of methods to control pests, with considerable emphasis on preventing pest problems by controlling conditions that may attract and support pests.

3. The **Oregon Green School Tools (GST): Creating Healthy School Environments through Resource Efficiency** stresses the value of resources – how to use materials, energy and water wisely at school and at home and provides five ‘Resource Efficiency Tools’ to help reduce the use of these resources in your school. The GST is written for everyone working on improving the health and livability of their school environment and suggests a ‘resource efficiency program’ that includes establishing an ethic of resourcefulness and changing wasteful behaviors.

4. The **Department of Environmental Protection (DEP) Manual for Implementing School Recycling Programs** describes materials commonly recycled in schools, various school recycling and composting programs and case studies, suggests a planning checklist for implementing a recycling program, and gives tips for rural and urban schools. The manual outlines the key elements in establishing waste diversion (including food waste) programs in schools and helps pinpoint the recycling system that is right for a school, with suggestions for planning and implementation.

5. The goal of the **Collaborative for High Performance Schools (CHPS) Best Practices Manual** (Massachusetts version) is to help school officials and their designers build a new generation of high performance school facilities in Massachusetts. This manual can assist schools participating in the Green Schools Pilot Program (a program which provides significant additional resources and funding to cities and towns that want to build high performance schools) as well as those that do not and are faced with the challenges of more limited funding.

The focus is on public schools and levels K-12, although many of the design principals apply to private schools and higher education facilities as well. The definition of a ‘high performance school’ is a school that is healthy, comfortable, energy efficient, resource efficient, water efficient, safe, secure, adaptable, and easy to operate and maintain. They help school districts achieve higher test scores, retain quality teachers and staff, reduce operating cost, increase average daily attendance, reduce liability, while at the same time enhancing and protecting the environment.

This Manual explains the benefits and characteristics (daylighting, indoor air quality, optimizing acoustics, lighting and controls, HVAC strategies, minimizing water use, using sustainable construction practices etc.) of a High Performance School, discusses financing options, and gives key steps in the high performance process.

6. **Daylighting in Schools: An Investigation into the Relationship between Daylighting and Human Performance** is a study that looked at the effect of daylighting on human performance. It includes a focus on skylighting as a way to isolate illumination effects from other qualities associated with daylighting from windows, such as view and ventilation. The report establishes a statistically compelling connection between daylighting and student performance.

7. The **Indoor Air Quality (IAQ) Tools for Schools Action Kit** is a step by step program, complete with videos, Problem-Solving Wheel, IAQ Coordinator’s Guide, a technical assistance hotline, and a “road map” with checklists (teacher’s classroom, ventilation, health officer/school

nurse, administrative staff, food service, waste management, building maintenance, renovation and repairs) for developing a comprehensive IAQ program at a school.

8. The Children's and Families Protection Act (CFPA) was created to protect Massachusetts school children from the harmful effects of pesticides so that they can realize their full potential. However, public participation is vital to ensuring that the true spirit of CFPA is implemented in schools and childcare programs throughout the Commonwealth. In order to make the law's intention a reality, citizen groups and parents need to advocate for the health of their children by educating local school and town officials about the dangers of toxic pesticides and the benefits of Integrated Pest Management. The **Citizen's Guide to Ensure Pesticide Use Reduction in Massachusetts** can help people develop a positive partnership with local school and town officials to effectively implement CFPA.

For more information on all the toolkits, please see references.

Service Learning for Sustainability

A Service Learning Program affiliated with a 'green' school project will identify innovative ways that elementary, middle, and high school students can become involved in deepening and strengthening their academic skills through participating in hands-on learning and community outreach. This program will involve students in fun after-school activities that will expand the participant's literacy, science and math skills, and their desire to learn. The program will not only enhance student academic learning and prepare them for active civic participation in a diverse democratic society in later years, but it will serve the community by building partnerships with many organizations and individuals in the greater Lowell area such as: the Revolving Museum, Coalition for a Better Acre, Keep Lowell Beautiful, Brox Farm, UMass Lowell Composting Program, UMass Lowell Health Sciences Department, and the City of Lowell Recycling Department. Through service learning, students will become practitioners that facilitate the local community's movement towards regional sustainability.

Conclusion

As a result of our research of existing practices used at other schools throughout the country, we discovered that none of the schools had used a 'comprehensive' approach to 'greening' their schools. One school built a new 'high performance school,' one focused on environmental, health and safety (EHS) issues, one implemented an Environmental Management System (EMS), one focused on indoor air quality, and some implemented a waste reduction program that included student participation.

While this research has not found a Best Practice Guideline for a "comprehensive" greening of a school that incorporates sustainability into curriculum, service learning, and the school buildings and grounds, the aforementioned case studies and toolkits can be looked at individually and then put together collectively to form this guideline for use in the City of Lowell.

We have therefore created a Best Practice Guideline for a Comprehensive Green Schooling Approach (see Attachment A) as a helpful tool for communities to use to achieve our concept of a 'green' school that includes classroom theory and practice in the school and will lead to service learning opportunities within the community. It is our belief that by educating youth on sustainability issues, it will have an influence on their peers, parents, and extended family members as they bring the message home from school thereby creating a multiple-ripple effect towards regional sustainability.

Recommendations

The case studies mentioned in this paper focus on one particular area of ‘greening’ a school, whether it is waste reduction, curriculum, improving air quality, or the building itself. We would recommend, for the city of Lowell, an integrated approach using our guideline to incorporating sustainability into curriculum, ‘greening’ the building and grounds, and service learning.

We recommend the development of a proposal for more research in developing an integrated and comprehensive approach that will assist the Rogers Middle School in becoming a model ‘green’ school that can be replicated within the Lowell school system and other schools in the area. Following that research, we recommend forming a solid proposal that will be submitted to one or more of the following foundations in order to implement the comprehensive model:

1. National Science Foundation
2. US Department of Education
3. Massachusetts Department of Education
4. Rockefeller Brothers Fund, Inc.
5. Environmental Protection Agency
6. Environmental Research and Education Foundation
7. Massachusetts Technical Collaborative

We will be proposing a project that will be a city, university, community, and schools partnership. It will involve a collaboration of various multidisciplinary departments at UMass Lowell (University Advancement, Center for Family, Work & Community, Toxics Use Reduction Institute, College of Health and Environment, and the Center for Health Sciences, Health Promotion & Public Health), City of Lowell (School Department [Rogers Middle School and the Greater Lowell Technical High School], Health Department, and the Department of Public Works – Recycling), community groups (Keep Lowell Beautiful and Merrimack Valley 2050), cultural community organizations (Revolving Museum), and a local farm (Brox Farm).

References

A Citizen’s Guide to Ensure Pesticide Use Reduction in Massachusetts. Toxics Action Center. June 2002. [Http://www.toxicsaction.org](http://www.toxicsaction.org)

A Manual for Implementing School Recycling Programs. Massachusetts Department of Environmental Protection. 2002.

“As Suburbs grow, so do waistlines.” Bradford McKee. New York Times. September 4, 2003. [Http://www.nytimes.com/2003/09/04/garden/04REPO.html](http://www.nytimes.com/2003/09/04/garden/04REPO.html)

Collaborative for High Performance Schools: Best Practices Manual Volume 1 – Planning (Massachusetts version). March 15, 2002. [Http://www.mtpc.org/RenewableEnergy/green_schools.chps_standards.htm](http://www.mtpc.org/RenewableEnergy/green_schools.chps_standards.htm)

Creating Safe Learning Zones: The ABC’s of Healthy Schools. August 2002. [Http://www.childproofing.org](http://www.childproofing.org)

Creating Safe Learning Zones: Invisible Threats, Visible Actions. January 2002. [Http://www.childproofing.org](http://www.childproofing.org)

Daylighting in Schools. Pacific Gas and Electric Company. August 20, 1999.

Green Schools: Using Energy Efficiency to Strengthen Schools.

Integrated Pest Management Kit for Building Managers. Massachusetts Department of Food and Agriculture. [Http://www.massdfa.org](http://www.massdfa.org)

Oregon Green School Tools: Creating Healthy School Environments through Resource Efficiency. [Http://www.deq.state.or.us/](http://www.deq.state.or.us/)

“Raising Consciousness, too.” Naomi Kooker. Boston Globe. January 19, 2003. p. B9.

The Education for Sustainable Development Toolkit. Rosalyn McKeown. July 2002. [Http://www.esdtoolkit.org](http://www.esdtoolkit.org)

Attachment A

Best Practice Guideline for a Comprehensive Green Schooling Approach

- Does your school have good **indoor air quality**? To improve air quality, you must ensure adequate ventilation and heating/cooling maintenance and eliminate or reduce the use of indoor solvents and Volatile Organic Chemicals (VOCs) such as formaldehyde, benzene, 4-PC (4-phenylcyclohexane), and toluene.
- Does your school have **pest problems**? The Integrated Pest Management (IPM) is a common sense approach, required by Massachusetts’ law, that uses a variety of methods with considerable emphasis on preventing pest problems by controlling conditions that may attract and support pests. If prevention methods fail, IPM uses the least toxic alternative.
- Does your school have a **Waste Management Program** that includes recycling, composting and vermicomposting? Many schools have realized the environmental and economic benefits of a waste management program that is put into the curriculum and involves hands-on student participation. A school must have dedicated space for recycling to maximize its effectiveness.
- Does your school make environmentally responsible **public procurement**? Using the lifecycle cost analysis instead of immediate cost analysis will have long term financial benefits for the school and improve environmental and community health.
- Is your school **energy efficient**? Does it consider alternative energy usage? Using energy efficient appliances (Energy Star), light bulbs, natural light, natural ventilation, renewable energy alternatives, high performance HVAC systems will help minimize non-renewable energy consumption.
- Are food service directors restricted by what they can provide for students in the cafeteria? Efforts should be made for food service directors to provide **locally-grown, organic, healthy, low-fat, low-sugar choices** that can minimize non-renewable energy consumption energy caused by long-distance transportation.
- Does your school endorse an **Environmental Management System (EMS)** approach? An EMS provides an on-going systematic model to encourage sustainable practices and activities such as environmental policy, chemical management, building operations, indoor air quality, waste management (recycling and improved solid waste storage), water quality/conservation, energy conservation, toxics use reduction and pollution prevention.
- Does your school incorporate **natural light** in building design? Studies have indicated a compelling connection between proper daylighting and student

performance. Appropriate daylighting can conserve energy and reduce the harsh glare from fluorescent lights.

- Does your school incorporate life cycle analysis in to **building material and product usage** to eliminate and reduce materials that are unhealthy and not environmentally friendly? Environmentally-friendly building materials will limit any negative health impact to school occupants and the environment. These materials are durable, cost-effective, and usually require lower maintenance. Polyvinyl Chloride (PVC) or vinyl is commonly used in flooring, piping, carpet fibers, windows, blinds, vinyl siding, and cables which has raised health and environmental pollution concerns during its manufacture and disposal.
- Does your school include sustainable development in its **curriculum**? Your school can support local sustainability by educating students to its importance and then become an effective tool to achieve sustainability through service learning activities in the community. The ESD Toolkit advocates that as communities develop sustainability goals, local educational systems can modify existing curriculums to reinforce those goals.
- Is the **drinking water** in your school tested? Does your school use **water conservation and reuse** strategies? It is important to test drinking water to ensure that lead and other impurities are not present. Low-flow plumbing fixtures and rainwater collection on site can save money and help the environment by reducing water consumption. Considering on-site treatment of building gray water and other wastewater can save money and help prevent combined sewer overflow problems.
- Does your school purchase, store, use, and dispose of **toxic chemicals**? Assessment and inventory of chemicals that your school purchases will help identify potential hazards. It is important to take a toxics use reduction approach by looking for non-hazardous or least hazardous alternatives to current practices. Furthermore, proper disposal of all chemicals will support a better community environment and overall health. In addition, exploring chemical recycling options could lead to cost savings by eliminating the cost of re-purchase of new chemicals and disposal of used chemicals.
- Does your school have a musty odor and/or visible discoloration and **mold** growth? Mold produces allergens, irritants, and in some cases, potentially toxic substances. Controlling indoor air moisture with careful attention and relative humidity meters can help prevent mold growth. Be vigilant of sources of moisture such as water leaks from pipes, leaky roofs, and water condensation on windows and surfaces. Clean and dry any wet or damp areas within 48 hours to prevent mold growth.
- Does your school employ traditional high maintenance **landscaping** techniques that require large consumptions of water, fertilizers, and herbicides? More environmentally-responsive site planning (such as Xeriscaping) utilizes native species plantings that require less water and are less susceptible to insect infestation eliminating the need to use toxic herbicides that in some cases have proven harmful to people, especially children. In addition, utilizing natural compost from the school will eliminate the need to purchase commercial fertilizer and reduce water consumption thereby providing cost savings.
- Does your school have an **Environmental, Health and Safety** Committee (EHS)? An EHS Committee will help ensure that your green school will function as a healthy and safe environment for workers as well as students and parents and the community at large.

- Does your school have **wall-to-wall carpeting** or area rugs in the entrance way and other locations? Carpets may not be the healthiest choice of flooring as many can contain up to 120 chemicals, many of them toxic. They usually have tufted nylon attached to a backing with latex. The installation of carpets requires glues, synthetic fiber backing and pads, all of which can introduce pollutants into the environment. Also, even after installation, carpeting can still pose problems by becoming a reservoir for dust, mites, mold, pesticides, and chemicals tracked in from the outdoors on footwear.
- Does your school building date back to the 1970s and earlier? **Lead** (found in plumbing, chipped and peeling lead-based interior paint, or contaminated soil from exterior paint), **radon** (an invisible and odorless gas that is problematic when it seeps into the school's water supply or through cracks in the foundation, floors, walls, and other opening near or below ground level and accumulates inside schoolrooms), and **asbestos** (used for insulation and fire retardation) remain concerns, especially in older school buildings.
- Is your school cleaned on a regular basis? Non-toxic cleaning materials should be used on a regular schedule to prevent dust build-up and the removal of dirt that can be tracked in. **Dust** could contain toxic substances and can cause allergic reactions and respiratory problems for some children and staff.

*Some of the materials in this checklist were taken from:

A Citizen's Guide to Ensure Pesticide Use Reduction in Massachusetts.

A Manual for Implementing School Recycling Programs.

Collaborative for High Performance Schools: Best Practices Manual.

Creating Safe Learning Zones: The ABC's of Healthy Schools.

Creating Safe Learning Zones: Invisible Threats, Visible Actions.

Daylighting in Schools.

Green Schools: Using Energy Efficiency to Strengthen Schools.

Integrated Pest Management Kit for Building Managers.

Oregon Green School Tools: Creating Healthy School Environments through Resource Efficiency.

The Education for Sustainable Development Toolkit.