



What Makes A Building Green?

By

Barbara Harrison for Earth Day Network

Topic: This lesson will examine the concepts of green building used in constructing or renovating a building.

Class and Level: High School – math, science, art, social studies

Unit Length: One week

Goals and Objectives:

- Students will be able to define what constitutes a green building.
- Students will understand the principles of green building.
- Students will understand the economic benefits of green building.
- Students will understand the criteria used for defining a green building product.
- Students will understand how to compare various products to assess environmental impact.
- Students will understand the advantages of using green products.
- Students will learn how to locate green products.
- Students will learn about green building programs.
- Students will learn how to set priorities when developing a green building project.
- Students will learn how to work within a budget.

Activities: Students will conduct an interview with someone who sells green materials, or designs or implements green building plans. This can either be in person, by telephone or through a written medium.

Activities:

Students will work in teams to develop a plan and construct a model of a building using green materials. The students need to be able to discuss the function of the building. Why they chose particular materials to use in the design of the building. What makes it a green building? Students need to be able to discuss the layout of the interior of the building. Where the building would be placed in the community. Students will also need to consider what becomes of the building materials if the building is upgraded or demolished, and the impact on the environment. They will present their plan and finished product to the class, as well as engage the class in discussion.

If students are not able to obtain specific building materials they may substitute products that are recyclable and note what these products are equivalent to.

Assessment:

Students must meet the criteria of the rubric that they received.

Activities:

Students will research green building community programs, then focus on one program and describe it in detail.

Activities:

Students will be given a budget to build a green building. Students will research the cost of materials to determine which materials will be included in the building process, prioritizing materials for inclusion due to budgetary factors.

Assessment:

Your results will be presented in written form and rationalizations for choice of materials need to be included.

Warm-up: Students will work together in groups of two or three to discuss what they think the differences are between a traditional building and green building. Each group will share their conclusions with the class.

Step 1: Discuss the differences between traditional building and green building methodology. Is there a difference in meaning between the terms green building design and sustainable building design or are the terms interchangeable? Websites that provide this information are The Whole Building Design Guide:

<http://www.wbdg.org/design/sustainable.php>? or

Smart Communities Network: <http://www.smartcommunities.ncat.org/buildings/gbintro.shtml>

Smart Communities also offers resources page.

Natural Resources Defense Council:

<http://www.nrdc.org/buildinggreen/default.asp>

City of Seattle

<http://www2.ci.seattle.wa.us/Implement/default.asp>

A green building is defined by the City of Oakland's Public Works Department as: "a 'Whole-Systems' approach for designing and constructing buildings that conserve energy, water and material resources and are healthier, safer, and more comfortable." In concrete terms, green buildings consist of one or the following:

- Using sun and wind to the building's advantage for natural heating, cooling and day lighting
- Landscaping with native plants and using water efficiently
- Building quality, durable structures
- Insulating well and ventilating appropriately

- Incorporating salvaged, recycled, and sustainably harvested materials
- Using energy-efficient and water-saving appliances and fixtures
- Reducing and recycling construction waste

Step 2: Using the above definition as a foundation, proceed to discuss the Principles of Green Building as defined on Smart Communities Network at:

<http://www.smartcommunities.ncat.org/buildings/grprinc.shtml>.

Green Building Principles:

- Energy Efficiency and Renewable Energy Resources
- Environmental Impact
- Resource Conservation
- Indoor Air Quality
- Resource Conservation
- Community Issues

Step 3: Discussion of economic benefits of green buildings. You will need to do a cost analysis. Designing the building in an integrative manner using a systems approach. The following are not quantifiable: occupant health, comfort, productivity, reducing pollution and landfill waste. Set aside part of the budget for looking at non tangible items that can not be measured for the purpose of researching and analyzing options.

Step 4: Discuss the standards for defining what makes a building product green. This information can be obtained by going through the materials at Environmental Building News. The information listed below was obtained from their site.

<http://www.greenerhomes.ca/storage/file/greenproducts.pdf>

University of Minnesota

<http://www.pca.state.mn.us/oea/greenbuilding/products.cfm>

1. Products Made with Salvaged, Recycled, or Agricultural Waste Content

“The materials used to produce a building product-where those materials came from-is a key determinant of green.”

- 1a. Salvaged products
- 1b. Products with post-consumer recycled content
- 1c. Products with pre-consumer recycled content
- 1d. Products made from agricultural waste material

2. Products That Conserve Natural Resources

The following products play a role in conserving natural resources. “These include products that serve a function using less material than the standard solution, products that are especially durable and therefore won’t need replacement as often, products made from Forest Stewardship Council (FSC) certified wood products made from rapidly renewable resources.”

- 2a. Products that reduce material use
- 2b. Products with exceptional durability or low maintenance requirements
- 2c. Certified wood products
- 2d. Rapidly renewable products

3. Products That Avoid Toxic or Other Emissions

“Some building products are considered green because they have low manufacturing impacts, because they use alternatives to conventional products made from chemicals considered problematic, or because they facilitate a reduction in polluting emissions from building maintenance.”

Substitute products that are made with hazardous materials may not be green by definition but compared to what they are replacing these products are looked upon as green.

- 3a. Natural or minimally processed products.
- 3b. Alternatives to ozone-depleting substances.
- 3c. Alternatives to hazardous products.
- 3d. Products that reduce or eliminate pesticide treatment.
- 3e. Products that reduce stormwater pollution.
- 3f. Products that reduce impacts from construction or demolition activities.

4. Products That Save Energy or Water

Energy and water usage used in building operation often impact the environment far more than the process of constructing the building.

- 4a. Building components that reduce heating and cooling loads.
- 4b. Equipment that conserves energy and manages loads.
- 4c. Renewable energy and fuel cell equipment.
- 4d. Fixtures and equipment that conserve water.

5. Products That Contribute to a Safe, Healthy Built Environment

Buildings should be constructed using products that provide an indoor environment that is both healthy and safe to live or work in and around.

- 5a. Products that do not release significant pollutants into the building.
- 5b. Products that block the introduction, development, or spread of indoor contaminants.
- 5c. Products that remove indoor pollutants.
- 5d. Products that warn occupants of health hazards in the building.
- 5e. Products that improve light quality.
- 5f. Products that help control noise.
- 5g. Products that enhance community well-being.

Step 5: Use an internet search engine to locate green building products.

Step 6: The sustainability of a building is determined by the budget of the client. In this exercise students will be given a budget that they must stay within. Before starting this project, students will be given information on establishing priorities to help decide how they need to approach the design. They will determine what aspects that are sustainable will be included and what has to be modified.

Establishing Priorities with Green Building can be found at Environmental Building News website www.BuildingGreen.com

Finding a Basis for Establishing Priorities

Consideration should be given to where your time and investment can best be used to reduce environmental impact. First you need to define what the environmental risks are. These can be examined from a variety of perspectives, such as globally, regionally, locally. You may want to look at how scientists gage risks. Secondly, you need to decide what part buildings play in these environmental risks and how the measures you are implementing in your building can abate these hazards. Third, you need to look at how effective the investment will be in impacting specific environmental areas. For example a specific area may require little investment and make a large environmental impact as opposed to an impact that might need a large investment of capital and be minimally effective. Lastly, we need to take into consideration available resources and what the client has in mind and how flexible the client is. We need to think creatively and strategize how to be most effective in implementing the plan.

The list that follows is not in a specific order and priority will depend on the project and climatic region.

Priority List for Sustainable Building

1. Save Energy-Design and build energy-efficient buildings.
2. Recycle Buildings-Utilize existing buildings and infrastructure instead of developing open space.
3. Create Community-Design communities to reduce dependence on the automobile and to foster a sense of community.
4. Reduce Material Use-Optimize design to make use of smaller spaces and utilize materials efficiently.
5. Protect and Enhance the Site-Preserve or restore local ecosystems and biodiversity.
6. Select Low-Impact Materials-Specify low-environmental impact, resource-efficient materials.
7. Maximize Longevity-Design for durability and adaptability.
8. Save Water-Design buildings and landscapes that are water efficient.
9. Make the Building Healthy-Provide a safe and comfortable indoor environment.
10. Minimize Construction and Demolition Waste-Return, reuse, and recycle job-waste.
11. Green Up Your Business-Minimize the environmental impact of your own business practices, and spread the word.

Conclusion: After the teams have completed their presentations before the class, everyone can gather to summarize key points of each presentation. Consideration may be given to present the projects to the school or having a “Green Fair”.