

5th Grade Science

1) Introduction: Service-learning is an excellent way to teach Science. Service-learning emphasizes a “hands-on” experiential approach as a means of connecting academic learning to real-world applications. This approach is an effective way of engaging students in scientific concepts, which can sometimes seem abstract. Service-learning brings students into direct contact with real-world community problem-solving and by framing the scientific method as a problem-solving tool itself, students can begin to see the impact science has on the world around us.

2) Definition of service-learning:

Service-learning is a form of teaching and learning that engages students in meaningful service activities in their schools and communities as part of the standard academic curriculum. Integrated into (but not limited to) the school day, service-learning connects young people with structured activities that address human and community issues, and that provide opportunities for increased student academic engagement, civic responsibility, personal and social development and the acquisition of critical thinking skills.

The following concepts are central to good service-learning practice. Evidence of these elements as well as their alignment with Pennsylvania state standards and the School District’s promotion/graduation requirements are key to model practices.

- **Student voice in choosing, developing and implementing a project:** Service-learning works best when students are involved in something relevant and meaningful to them. Encourage student participation and sharing of responsibility in all aspects of a project.
- **Identification of genuine need:** The “community” identifying the need can be the class, the school, the neighborhood, a community partner, the city, etc. Goals for addressing problem have the support of designated community and clearly defined objectives.
- **Mutual benefit for students and community partner(s):** Students acquire knowledge and skills, and in return contribute a short or long-term solution to the problem. Sensitivity to needs and/or limitations of all parties is important.
- **Sustained student involvement:** Length of project can vary but should span a minimum of 6 weeks. Projects with greater richness and complexity may last a semester or an entire school year.
- **Rigorous, multidisciplinary research:** Projects should meet content standards in at least two academic disciplines and demonstrate writing and research competence. Research can explore root causes/effects, potential solutions or public policy related to the problem.
- **Ongoing reflection:** Reflection activities should occur throughout the project. They reveal cognitive and affective learning and can incorporate speaking, writing and/or multimedia strategies.
- **Assessment of student learning and project impact:** Evaluates academic, personal and social development as well as whether stated community need has been

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met/addressed. Rubrics and other authentic assessment tools are preferred.

- **Culminating presentation:** Presentations or exhibitions of learning allow students to demonstrate what they have learned for the benefit of others, including community partners. This may occur through oral presentations, culminating events, and/or artistic expressions.
- **Final celebration:** Positive change and collaboration is hard work! Acknowledge and celebrate the contributions and accomplishments of all who were involved.

3) Sample Project Description

A sample project description is included for your convenience. This particular project is not required, however, it is designed to fit the core curriculum for this subject and it reflects an issue of global concern. Teachers are encouraged to transform this project and take it in new directions.

Solar Ovens

This project has students researching the importance of then constructing solar ovens as they learn about energy efficiency. In many parts of the world, people have to chop wood and haul it long distances in order to create fires to cook food. This is a difficult and arduous process and has also led to massive deforestation problems in some parts of the world. In addition, safe drinking water is hard to come by and due to the difficulties of generating heat, water is not often sanitized by boiling before drinking. Finally, indoor kitchens that use wood burning stoves often retain smoke and contribute to air pollution. For all of these reasons, some groups have advocated the distribution of solar ovens, which can be very simple contraptions, to people in developing countries to improve living conditions as well as protect natural resources.

Students will learn about these issues (3.8.7 A, B) and create their own solar ovens in which to cook food. Solar ovens can be easily created with aluminum foil and a cardboard box. They will compare energy usage between this method and other more traditional methods of cooking. They will learn how energy from the sun is converted to heat and then eventually into cooked food (3.4.7 A, B). They will learn about the importance of thoroughly cooking foods to prevent disease and why this is a particular problem in developing nations (3.5.7 B, D). As they research the problems people face in developing countries, students should decide how best to make an impact and to reach out in some meaningful way by raising awareness in their school or community, raising money, partnering with a school in a developing country, and/or writing letters to elected officials.

4) Sample Lessons/Activities

Situating Students in the Problem

- Use newspaper articles, movies, books, and other media to introduce students to concepts of poverty in developing nations, emphasizing household issues such as the chores and tasks, roles of family members, and general resources and quality of life issues.

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- Bring in a guest speaker to talk about these issues (perhaps a Returned Peace Corps Volunteer).

Research

- Look at how the sun reflects on different parts of the oven and where shadows are created. Compare “cooking” between an oven in the sun and an oven in the shade over time by using graphs. (3.1.7 E; 3.2.7 B, C; 3.5.7 C; 3.7.7 B)
- Learn about water borne bacteria and how they can spread disease (3.3.7 B, 3.5.7 D)
- Compare various forms of energy especially as it related to cooking. Make charts about where cooking energy comes from in their homes and around the world (i.e. electric, gas, wood burning, and solar). Which are renewable? (3.6.7 A)
- Make models of solar ovens before actual construction. (3.1.7 B, D; 3.4.7 C; 3.6.7 B)
- Compare the long-term environmental effects of replacing wood burning with solar ovens vs. conventional electric or gas ovens such as are common in the U.S. (3.8.7 C; 3.2.7 D)

Creating a Solution

- Sponsor a solar cooking contest in the community or the school that can be both a fundraiser as well as an educational event for the community.
- Hold a multicultural food festival at which children eat foods cooked in solar ovens that also represents traditional foods of various developing nations that are starting to use solar oven technology.
- Partner with a school in a developing country that uses solar oven technology to learn more about how that technology has impacted daily life. (3.8.7 C)

Assessment

- Compare solar ovens that are different colors (dark and light) to demonstrate increased absorption of darker colors. (3.4.7 B)
- Conduct surveys of participants in any kind of community information and outreach event (cooking contest, food festival, etc.) to determine if event was effective in raising awareness.

5) Sample Rubric

Rubrics can be used at all steps of the service-learning process. Each activity can have its own rubric, and you can use a cumulative rubric to assess student work at the end of the project. Here are two sample rubrics that assess student learning, one on developmental growth and one on task completion.

See attached

6) Multidisciplinary connections

ELA – Persuasive letters to elected officials, research projects, letters to community members and organizations to solicit participation in project, letters to local business to donate supplies

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Math – Measuring, comparing, and graphing temperatures of food in solar cookers; budgeting money for project

Social Studies – Cross cultural connections re: developing countries; writing letters to elected officials (civics and government); organizing community meetings and educational events

7) For more information:

Solar Cooking Archive

<http://solarcooking.org/>

Introduction to Solar Cooking (Power Point)

<http://solarcooking.org/Introduction-to-Solar-Cooking.ppt>

Solar Energy International

<http://www.solarenergy.org/>

EPA Website for Kids on Global Warming

<http://www.epa.gov/globalwarming/kids/>

Dept. of Energy – Energy Efficiency and Renewable Energy for Kids

<http://www.eere.energy.gov/kids/solar.html>

8) Local resources:

Alliance to Save Energy: Green Schools Programs

<http://www.ase.org/section/program/greenschl/spirit/pennsylvania>

Delaware Valley Earth Force

<http://www.earthforce.org/section/offices/delval/>

Philadelphia Area Peace Corps Association

<http://www.geocities.com/TheTropics/9869/>

Sustainable Business Network

<http://www.sbnphiladelphia.org/Phila/>

This curriculum insert was developed by Hillary Aisenstein, Director of the Philadelphia Higher Education Network for Neighborhood Development (PHENND), as part of a collaborative effort between the School District of Philadelphia and several local community-based service-learning organizations, designed to integrate service-learning with the new core curriculum.