

4th 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 keys 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 a common issue or problem in many of Philadelphia's communities. Teachers are encouraged to transform this project and take it in new directions.

Storm Water Runoff and Pollution

This project has students looking at local examples of phenomena studied in the "Land & Water" unit during the first twelve weeks of the school year. As students learn about mapping (4th grade social studies) students will look at aerial photographs of the city and identify waterways and roadways. They will learn about how car-related pollutants (oil, gasoline, coolant, etc.) can pollute water and how these pollutants move from the automobile to the roadway and then from the roadway to waterways via rainstorms, producing the effect of "storm water runoff" (4.8.4 C). They will also learn about how people often dispose of hazardous materials such as motor oil or pesticides in curbside storm drains further polluting Philadelphia's water supply as well as about various manufacturing processes that cause pollution (3.6.4 C; 4.3.4 B). Students will then undertake some type of projects to alleviate these conditions, such as storm drain stenciling, whereby students place stickers on drains in their community that warn people of the dangers of pollution. (4.6.4 C; 4.8.4 C; 3.2.4 A,B,C,D)

Other project ideas related to Integrated Pest Management, which educates students and community members on the hazards of traditional chemical pesticides (4.5.4 A, B, C) and their improper disposal. Or, students may do projects around automotive pollutants such as trying to reduce car usage or promote the recycling of motor oil.

4) Sample Lessons/Activities

Situating Students in the Problem

- Review the water cycle (4.1.4 A, B; 4.6.4 B)
- Discuss the availability of potable water in the school and the local community. Where does the water in the school come from? Where does Philadelphia's water come from?
- Take a trip to the Fairmount Water Works
- Have students create their own models of storm water runoff involving sand, pebbles, and water (3.1.4 B)
- Study the effects of water pollution on the human body (4.3.4 A, B, C)

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Research

- Visit a local body of water and conduct tests for various kinds of household pollutants (3.2.4 C, 3.5.4 A, 3.7.4 B)

Creating a Solution

- Storm drain stenciling
- Designing brochures or other informative pieces to educate the broader community about storm water runoff and water pollution
- Integrated Pest Management
- Reducing car usage and/or promoting motor oil recycling

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

Social studies – Make a map of all curbside drains in the community; explore history of creeks to sewers in Philadelphia and the development of the sewage system

English – Have students write a play of the water cycle and its interaction with different landforms

Art – Use different media to illustrate the storm water runoff process; design informational brochures or posters for the broader community

Drama – Put on a play of the water cycle, showing how land and water interact

7) For more information:

Pennsylvania Integrated Pest Management Program

<http://paipm.cas.psu.edu/index.html>

Franklin Institute Community Action Science Guides

<http://sln.fi.edu/guide/index.html>

Teaching Water

<http://www.scienceteachingideas.com/water.htm>

Stormwater Management

<http://www.teachingtools.com/H2O/StormwaterMngt.htm>

Aerial Maps of Philadelphia

<http://citymaps.phila.gov/citymaps/>

Soil and Water Conservation Society

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

8) Local resources:

Delaware Valley Earth Force

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

215-884-9888

Water Resources Education Network

<http://pa.lwv.org/wren/>

Franklin Institute

<http://sln.fi.edu/>

Schuylkill Center for Environmental Education

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

215-482-7300

Cobbs Creek Environmental Education Center

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

215-685-1900

Pennypack Environmental Center

<http://www.nlreep.org/pecwin02.htm>

215-685-0470

University of Pennsylvania Access Science Program

<http://www.upenn.edu/ccp/AccessScience/>

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.