

Recycling by Composting

Introduction

Students are probably already aware that disposing of America's trash is a major environmental problem. As landfills around the country grow and reach capacity, recycling becomes increasingly important. Your class may be surprised to find out that about 30 percent of the trash produced in the U.S. is composed of organic yard and food waste. Composting these materials would not only reduce the burden on landfills, but the resulting compost could be used to improve soil quality, stem erosion, and aid plant development.

In this project, students will investigate the amount of food and yard waste produced in your local area. They will perform an experiment to find out how compost can improve soil quality and help plants grow. Finally, they will organize a composting project and fertilize a garden.

This project incorporates elements of the [scientific method](#).

Grade level

Middle school, but can be adapted to suit other grades

Time allotment

Up to 1 semester

Subject matter

Main focus on environmental science, with language arts and social studies connections

Learning objectives

Students will:

- Gain an understanding of the scientific method and use the scientific method to conduct all phases of the project.
- Research the environmental benefits of composting.
- Discover how much organic food and yard waste is produced in their community, learn if the town has a community-composting site, and find out how much is currently being composted.
- Organize a composting project and use the resulting compost to improve the soil quality of a garden.

Standards

- North American Association for Environmental Education (NAAEE)
Excellence in Environmental Education: Guidelines for Learning
http://naaee.org/npeee/learner_guidelines.html
Strand 1—Questioning and Analysis Skills (Guidelines A, C, E, F); Strand 2.2—The Living Environment (A, C, D); Strand 2.4—Environment and Society (A); Strand 3.1—Skills for Analyzing and Investigating Environmental Issues (A, B, C); Strand 3.2—Decision-Making and Citizenship Skills (A, B, C, D); Strand 4—Personal and Civic Responsibility (C, D).
- Technology Foundation Standards for Students
<http://www.iste.org/standards>
Standard 1: Basic operations and concepts; Standard 3: Technology productivity tools; Standard 4: Technology communications tools; Standard 5: Technology research tools.

Assessment

Students will reflect in writing on how it felt to be an environmentalist. They will report on the results and importance of their project by sending a description to local officials and newspapers, asking for their support of composting. To further share their experience, students will use their research, experiment results, and any photos or drawings to create a scrapbook or Web site explaining their project.

Computer resources

- Modem: 56.6 Kbps or faster
- Browser: Netscape Navigator 4.0 or above or Internet Explorer 4.0 or above
- Macintosh computer: System 8.1 or above and at least 32 MB of RAM
- Personal computer (Pentium II 350 MHz or Celeron 600 MHz) running Windows® 95 or higher and at least 32 MB of RAM
- RealPlayer plug-in. Download for free at <http://www.real.com>

Materials needed

- WHAT'S UP IN THE ENVIRONMENT video (optional)
- For the chart graph paper (optional)
- Composted soil
- Gardening tools (spade, 10 large flowerpots)
- Soil test, pH kits
- Indigenous, fast-growing seeds
- Data records (Excel, or notebook or log book)
- Camera
- Excel (optional)
- PowerPoint (optional)

Online resources

Teacher tool Web sites

- Web Page Building Sites
<http://www.homestead.com>
<http://build.tripod.com/classroom/demo/>
<http://www.myschoolonline.com/>
If you or your students chose to do any of the Web site building activities but have limited or no knowledge of html, try one of these Web building sites. They are free, and they allow you to input images and text without writing or knowing any code.
- Instructional Technology Resource Page
<http://www.itsconnection.com/>
This site gives free online instructions on use of many kinds of software including PowerPoint and MS Word.
- Global Schoolhouse Internet Project Registry Page
<http://globalschoolhouse.org/pr/index.html>
This site allows you to either post a request for other classrooms to collaborate with you, or you can search existing projects to see if your data collection is already being done!
- Environmental Protection Agency: Contact Information
<http://www.epa.gov/epahome/comments.htm>
Scroll down to the map and click on your region to get contact information for your local EPA office. Consult with local officials to get information about waste disposal in your community.

- The National Gardening Association: Soil Testing Article
<http://www.garden.org/articles/scripts/articles.taf?id=685&kwd=soil%20testing%20kit&Articlesstart=>
If you want your class to conduct its own soil test, this article gives a useful overview of the strengths and weaknesses of different kinds of tests.
- Compost Resources for Home Composters and Gardeners
<http://www.mastercomposter.com/vendor/buyonlin.html>
This site provides a number of links to gardening stores that sell compost.

Bookmark these Web sites for students

Global warming research sites

- United States Census Bureau: Quick Facts Page
<http://quickfacts.census.gov/qfd/index.html>
Get national or local population statistics.
- Annenberg Channel: Garbage Exhibit
<http://www.learner.org/exhibits/garbage/intro.html>
This site provides an overview of the different kinds of waste, how they are disposed of, and the problems surrounding landfills.
- Friends of the Earth Citizen's Guide to Municipal Landfills
<http://www.foe.org/ptp/manual.html>
This site offers information about municipal landfill problems, along with an explanation of the chemical process of waste decomposition.
- For My World
<http://www.formyworld.com/forums/askexpert.cfm>
This Web site is sponsored by a partnership of non-profit environmental agencies and offers excellent resources including an ask-the-expert feature. Use this resource to ask about waste management problems.

Waste management information

- Environmental Protection Agency: Contact Information
<http://www.epa.gov/epahome/comments.htm>
Scroll down to the map and click on your region to get contact information for your local EPA office. Consult with local officials to get information about waste disposal in your community.
- Environmental Protection Agency: Office of Waste Management
<http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/index.htm#list>
Scroll down to the bottom of this page for a complete listing of landfills nationwide. Use this to find landfills in your area.

Composting information

- The Compost Resource Page
<http://www.oldgrowth.org/compost/compost.html#history>
This site gives a comprehensive overview of composting.
- Environmental Defense Composting: Nature's Recycling Program
<http://www.edf.org/heap/>

Get the facts about composting and find what it takes to start your own composting program in your community or school.

- The Compost Resource Page
<http://www.oldgrowth.org/compost/compost.html#history>
Read up on the history of composting, and find out why it is invaluable.
- National Wildlife Federation: Take Action
<http://www.nwf.org/action/howtos/>
This site gives great advice on how to write to local media, write press releases, plan campaigns, and more. You may want to have your students consult this site for advice on how to promote their composting campaign within their school or even their community.

Step 1 - State the Problem [More information about this step](#)

Introductory activity waste statistics

Begin by examining how much waste we generate. Have students start to understand this problem by keeping a log of the amount of waste they create for one day. They should record:

- what they throw out,
- the estimated weight of each piece of garbage,
- whether it's organic,
- and if it is a recyclable product.

The next day, have the class determine the following about their garbage:

- What is the average total weight of garbage produced by students in this class?
- How much of that garbage is recyclable?
- How much of that garbage is compostable matter?
- Try to figure out the same statistics on a national level. Visit the US Census site for current population figures.

Put the information into a pie chart to determine the percentage of the waste that is organic matter. Then have them find out if we have the means to dispose of all of this waste now and in the future.

Optional extension: To get more data and accurate statistics, invite other classes or schools to keep a waste log. Then share data and complete a statistical analysis. Share the results with the other classes or schools via e-mail or Web site. See the teacher tools for sites for resources.

Resources for step 1

Materials needed

- For the chart Excel (optional) or graph paper

Teacher tool Web sites

- Sites that have ready-made Web pages
<http://www.homestead.com>
<http://build.tripod.com/classroom/demo/>
<http://www.myschoolonline.com>
If you or your students chose to do any of the Web site building activities but have limited or no knowledge of html, try one of these Web building sites. They are free, and they allow you to input images and text without writing or knowing any code
- Global Schoolhouse Internet Project Registry Page
<http://globalschoolhouse.org/pr/index.html>
This site allows you to either post a request for other classrooms to collaborate with you, or you can search existing projects to see if your data collection is already being done!

Bookmark these Web sites for student research

- United States Census Bureau: Quick Facts Page
<http://quickfacts.census.gov/qfd/index.html>
Get national or local population statistics.
- Annenberg Channel: Garbage Exhibit
<http://www.learner.org/exhibits/garbage/intro.html>
This site provides an overview of the different kinds of waste, how they are disposed of, and the problems surrounding landfills.
- Friends of the Earth Citizen's Guide to Municipal Landfills
<http://www.foe.org/ptp/manual.html>
This site offers information about municipal landfill problems, along with an explanation of the chemical process of waste decomposition.
- For My World
<http://www.formyworld.com/forums/askexpert.cfm>
This Web site is sponsored by a partnership of non-profit environmental agencies and offers excellent resources including an ask-the-expert feature. Use this resource to ask about waste management problems.

[▲ BACK TO TOP](#)

Step 2 - Research, and Hypothesize or Predict [More information about this step](#)

Research local waste

Now have students explore how their community handles waste management. They should focus on the benefits of composting. Give them the following questions to research, or have student groups develop their own set of questions.

- How much and what kinds of waste are generated in your community?
- How and where is waste dealt with in your community? (Is it incinerated, sent to a landfill, etc.?)
- How long do the different kinds of waste take to break down using the different methods?

- How much of your community's garbage can be composted?
- What are the benefits of composting? How would it benefit your community?
- How does composting work? (What methods and materials are used, what is the process, etc.)
- How does composting impact soil quality?
- How much does it cost to compost?

Get in touch with your local sanitation department, environmental commission, and local environmentalists to find the answers to these questions. Use the Web sites listed below to find local listings. Ask if there is a composting program in your area, and take a field trip to the location to find out how it works and how much waste is composted. Make sure to take some compost back with you to complete the experiment in [step 3](#).

Hypothesis

Using all your research, create a hypothesis for this question: What impact would increased composting have on my community? How would mixing in compost affect the soil quality in my community?

Resources for step 2

Teacher tool Web site

- Environmental Protection Agency: Contact Information
<http://www.epa.gov/epahome/comments.htm>
Scroll down to the map and click on your region to get contact information for your local EPA office. Consult with local officials to get information about waste disposal in your community.

Bookmark these Web sites for student research

Waste management information

- Environmental Protection Agency: Office of Waste Management
<http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/index.htm#list>
Scroll down to the bottom of this page for a complete listing of landfills nationwide. Use this to find landfills in your area.

Composting information

- The Compost Resource Page
<http://www.oldgrowth.org/compost/compost.html#history>
This site gives a comprehensive overview of composting.
- Environmental Defense Composting: Nature's Recycling Program
<http://www.edf.org/heap/>
Get the facts about composting and find what it takes to start your own composting program in your community or school.
- The Compost Resource Page
<http://www.oldgrowth.org/compost/compost.html#history>
Read up on the history of composting, and find out why it is invaluable.

Step 3 - Plan Experiment and Gather Data [More information about this step](#)

Now have your class do an experiment to test the hypothesis you made in [step 2](#). If you were unable to get compost soil from the field trip, you can make your own as described in [step 4](#), or buy it. (See teacher tools below for help). Next, dig up a sample of soil from an area with poor soil quality such as a playground or a frequently traveled path. You may want to conduct a soil test. Mix half of your sample with an equal amount of compost and put it into five large flowerpots. Put the rest of the soil sample into another five flowerpots without any compost. Plant the seeds of a few different fast-growing local plants in each pot. Make sure the conditions in each pot of soil (test soil and control soil) are the same. A group of students can be assigned to make sure the plants all get the same amount of sunlight and water. If possible, have students photograph the daily growth of the plants.

Recording data

Talk to students about what kind of data they'll need to record, how often they'll need to record it (we recommend daily), and how they should organize it. We recommend that groups of students be assigned to record the following for an individual plant over a period of two or more weeks:

- daily plant growth and health,
- pH level of the soil (many plants grow best in soil with a pH between 6 and 7),
- amount of sunlight, water, and temperature that the plant gets.

Resources for step 3

Materials needed

- composted soil
- gardening tools (spade, 10 large flowerpots)
- soil test, pH kits
- indigenous, fast-growing seeds
- data records (Excel, or notebook or log book)
- camera (optional)

Teacher tool Web sites

- The National Gardening Association article on soil testing <http://www.garden.org/articles/scripts/articles.taf?id=685&kwd=soiltestingkit&Articlesstart=>
If you want your class to conduct its own soil test, this article gives a useful overview of the strengths and weaknesses of different kinds of tests.
- Compost Resources for Home Composters and Gardeners <http://www.mastercomposter.com/vendor/buyonlin.html>
This site provides a number of links to gardening stores that sell compost.

Step 4 - Analyze the Data and Make a Conclusion [More information about this step](#)

Use the data from measuring the plants to create a line graph showing the growth rate for each plant. Once complete, ask students what conclusions they can draw from the data, or have them answer the following:

- Is the soil packed down?
- What is the pH-level?
- What other signs are there to show the fertility of the soil?
- How healthy are the plants in each pot?

Compare the soil quality in each pot. Using your observations and data, what conclusions can you make about the impact of compost soil on growth? Could compost be used to improve the soil quality all over your community? Are there areas in your community, such as contaminated, abandoned lots, where poor soil could be reclaimed by compost? Have students use images of the plants, and written descriptions of their findings in a written report, PowerPoint presentation, or Web page. See resources below for help.

Resources for step 4

Materials needed

- For report: PowerPoint or word processing software or use Web building resources listed in teacher tools

Teacher tool Web sites

- Web Page Building Sites
<http://www.homestead.com>
<http://build.tripod.com/classroom/demo/>
<http://www.myschoolonline.com>

If you or your students chose to do any of the Web site building activities but have limited or no knowledge of html, try one of these Web building sites. They are free, and they allow you to input images and text without writing or knowing any code.

- Instructional Technology Resource Page
www.itsconnection.com

This site gives free online instructions on use of many kinds of software including PowerPoint and MS Word.

 BACK TO TOP

Step 5 - Take Action

Have students visit the sites listed below to get advice on planning and implementing a composting program in your school. Decide what composting method will work best —with the right equipment, it's even possible to compost indoors if necessary. When the compost is ready, mix it into a garden at your school or a local park. (Make sure to ask for permission first.) Plant a flower garden in the new, rich soil.

Resources for step 5

Materials needed

- Composting materials as listed in the Backyard Magic site below

Bookmark these Web sites for student research

- National Wildlife Federation: Take Action
<http://www.nwf.org/action/howtos/>
This site gives great advice on how to write to local media, write press releases, plan campaigns, and more. You may want to have your students consult this site for advice on how to promote their composting campaign within their school or even their community.
- Environmental Defense Composting: Nature's Recycling Program
<http://www.edf.org/heap/>
Get the facts about composting and find what it takes to start your own composting program in your community or school.

 A green rounded rectangular button with a small upward-pointing triangle icon on the left and the text "BACK TO TOP" in green capital letters.

Step 6 - Assessment

While organizing the composting project, take pictures, write articles, and interview environmentalists (including yourselves). Keep track of how many pounds of waste were recycled by composting. After composting, reflect by writing about the experience and how it felt to be an environmentalist.

Send a description of the project to a local newspaper and officials. Ask them to support composting, and explain how more composting could improve the local environment. Gather all the materials made during this project and build a Web site or make a scrapbook about to share with others. [Send us your Web project](#) and we'll post it on the WHAT'S UP IN THE ENVIRONMENT Web site!

If possible, return to the garden where you added the compost a year later to see how the garden is doing and test the soil. Analyze the new environment you helped promote and see how it made a difference! Send us your results with a Web site update.

Resources for step 6

Teacher tool Web sites

- Web Page Building Sites
<http://www.homestead.com>
<http://build.tripod.com/classroom/demo/>
<http://www.myschoolonline.com>
If students want to create their own Web sites, but do not know html, have them use the pre-made templates from these sites to create their pages.
- Instructional Technology Resource Page
<http://www.itsconnection.com>
This site gives free online instructions on use of many kinds of software including PowerPoint and MS Word.