

Compost Office

Understanding Composting

Objectives

Students will be able to: 1) identify materials needed in the composting process; 2) identify problems that may arise in composting; and 3) list ways to use compost.

Web-Directed Research

These activities correlate with the Keep America Beautiful “Clean Sweep U.S.A.” web site targeted to grades 6-8, and are designed to expand on the objectives in this lesson. The web site can be found at www.kab.org/cleansweepusa.

1. Define “**compost**,” “**composting**,” and “**humus**”. Describe the basic biology of composting. What can be composted? Find one unusual or “weird” item that can be composted (e.g., zebra mussels, food processing by products, hazardous materials, etc.)
2. What is the difference between backyard composting and community composting? What is composted in their community and how is it collected? Does their school compost?
3. How is compost used? Why is it beneficial? What happens to the finished compost in their community?
4. How would they set up a compost pile at home? What are the requirements? What materials are acceptable to compost in the back yard? What materials should be kept out?

Web sites to consult:

- How Stuff Works (www.howstuffworks.com/composting.htm)
- Cornell Composting (<http://compost.css.cornell.edu/schools.html>)
- U.S. Environmental Protection Agency (<http://www.epa.gov/epaoswer/non-hw/compost/index.htm>)
- Master Composter (www.mastercomposter.com)
- Earth 911 (www.earth911.org)
- Local Master Gardener and back yard composting programs

In-Class Activity

Method

Students will work cooperatively to create a composting system, solve composting problems, and use resulting compost in and around the school and home.

Materials

a plastic tub or empty fish tank with a lid, samples of various types of soil (sand, silt, loam, clay), soil from outdoors, container of water, spray bottle, thermometer, a small hand shovel, work gloves (optional), copy of “Compost Pile Troubleshooting” (included at the end of this lesson) posted in the classroom, organic matter such as kitchen or yard wastes (some or all of the following):

high in nitrogen:

high in carbon:

coffee grounds	hay or straw
egg & nut shells	leaves
grass clippings	ashes
manure (or fertilizer)	sawdust & wood chips
	shredded paper
	weeds & other garden wastes

Vocabulary

aeration, compost, microbes, organic, porosity

Procedure

1. Background: Composting is a biological process during which organic materials, such as grass and leaves, are broken down by microbes into a soil-like product. It is a form of recycling, a natural way of improving the texture and porosity of soil.

Tiny living things do much of the work of breaking down organic materials to form compost. These tiny workers, called microbes or microorganisms, include such things as bacteria and fungi. Animals living in the soil help microorganisms break down organic materials. Worms and pill bugs are examples of soil animals that help change organic wastes into compost.

As microorganisms and soil animals turn organic materials into compost, they use the organic materials as food. The organic materials provide nutrients for growth and activity. Eventually, these nutrients are returned to the soil, to be used again by trees, grass, and other plants. This is nature's way of recycling.

By composting at school or home you can return organic wastes to the environment as valuable resources for other living things.

2. Show students samples of different soil types (sand, silt, loam, clay). Discuss good soil and poor soil. Introduce the terms "compost" (the finished product) and "composting" (the process). Explain that compost is a way to improve the physical properties of soil (texture and aeration). Composting is a natural (biological) process during which organic material, such as leaves, grass and selected kitchen wastes, are turned into a soil-like product. Yard and kitchen waste is often thrown away and buried in a landfill. Composting can transform yard and kitchen waste into a rich, organic soil additive.
3. For composting without the addition of soil animals, such as earthworms, a plastic tub or empty fish tank will serve as the composting site. Tell the students that they will be building a small compost pile in the classroom to learn about the process first-hand. The classroom model will contain only yard wastes and **selected food wastes**. It will also use only microorganisms found naturally in soil used from the outdoors; other soil animals will not be specifically added to this composting model, although, some may be present in the soil used as "cover."
4. Prepare the compost materials. Have students bring in chopped up yard wastes including leaves, grass, hedge clippings, and weeds. The smaller that waste is chopped up, the faster it will break down into compost. The mixture should contain a combination of materials high in nitrogen and high in carbon.

high in nitrogen:

high in carbon:

coffee grounds	hay or straw
egg & nut shells	leaves
grass clipping	sashes
manure (or fertilizer)	sawdust & wood chips
	shredded paper
	weeds & other garden wastes

5. Build the compost pile by following these steps:
 - Put a layer of coarse materials (sticks, small brush, larger pieces of bark) on the bottom of the container to create a way for water to drain and air to circulate.
 - Mix the chopped yard wastes together; the more variety of materials, the better. Lay a one to two inch layer on top of the bottom layer.
 - Cover organic wastes with a one inch layer of soil.
 - Adjust the moisture in your compost pile. Add straw or sawdust to soggy materials. If the pile is too dry, add water using a spray bottle. The materials should be damp to the touch, but not so wet that water comes out when you squeeze it. (Refer to "Compost Pile Troubleshooting" as needed.)
6. Maintain the compost pile until the compost is "done." Using a small shovel, mix or turn the pile weekly. This adds air and mixes up the different wastes, preventing the compost from getting smelly. The compost is "done" when it is crumbly not sticky, dark in color but not black, and smells earthy but not rotten. Your compost pile may be "done" in one or two months.
7. Heat is produced within the compost pile due to chemical reactions. In compost piles larger than one cubic yard, temperatures reach 140⁰ to 160⁰ Fahrenheit (32⁰ to 60⁰ Celsius) in the center. These high temperatures sterilize the compost. Have students monitor the temperature of the classroom compost pile as a way of tracking progress. How high did temperatures get? The pile will settle down from its original height. This is a good sign that it is composting properly.
8. Discuss the qualities of a good compost pile:
 - A good compost pile is kept moist but not soggy.
 - A good compost pile has enough oxygen. Good compost piles are aerated by stirring regularly.
 - A good compost pile has a good mix of organic ingredients.
 - A good compost pile contains nitrogenous material. Nitrogen is required by the decomposing organisms. Some compost piles use manure as the nitrogen source; grass clippings or coffee grounds may be substituted.
9. Have students brainstorm a list of suggested uses for the finished compost. Be sure to include the following:
 - Spread compost on a garden in the spring before turning the soil for planting.
 - Place or bury compost in a garden between plant rows. The plant roots will grow into the compost and take up nutrients.
 - Use compost as mulch for shrubs, trees, and plants.
 - When transplanting house plants, add compost to the soil.
 - Do not use compost to sprout tender seeds.

Assessment

Have students describe materials that are used in composting and why.
Have students illustrate the layers in a compost pile and label them.
Have students list possible uses for compost.

Compost Pile Troubleshooting		
Symptom	Problem	How to Fix It
pile is wet and smells like a mixture of rancid butter, vinegar, and rotten eggs	• not enough air • or too much nitrogen • or too wet	• turn pile • add straw, sawdust or wood chips • turn pile and add straw, sawdust or wood chips; provide drainage
pile doesn't heat up	• pile is too small • or pile is too dry	• make pile larger • add water
pile is damp and sweet smelling but will not heat up	• not enough nitrogen	• add grass clippings or other sources of nitrogen
center is dry and contains tough materials	• not enough water	• add water and turn pile
pile is attracting animals	• meat and other animal products have been added	• keep meat and other animal products out of the pile; • enclose pile in a 1/4" hardware cloth
Adapted from: Demonstrating Home Composting, University of Michigan. Used with permission.		

Standards of Learning

The North American Association for Environmental Education (NAAEE) Guidelines for Excellence in Environmental Education can be found at <http://naaee.org/npeee/learnerguidelines/8th.html>. The Guidelines for Learning which correlate to this lesson are: Strand 1 A, B, F; Strand 2.3 A; Strand 3 A; Strand 4, A, D.