



Outdoor



Time

60 minutes, plus monitoring

Science Key

Life Science
Earth Science
Physical Science
Science, Technology, and Society

Related Subject

Math

Process Skills

Applying
Measuring



Materials

For the Class or Compost Group:

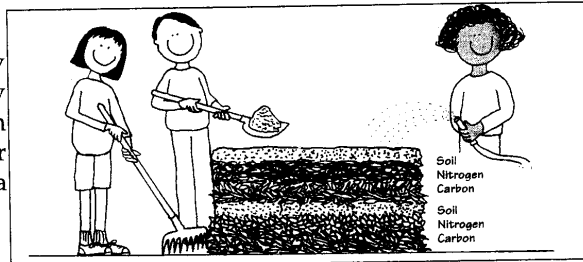
- shovels
- spading forks
- wheelbarrow
- meter stick or tape measure
- at least 3 large lawn bags of carbon-rich materials such as straw, dried leaves, or dried grass
- at least 3 large lawn bags of nitrogen-rich materials such as kitchen scraps, green lawn clippings, leaves, and weeds
- soil
- watering hose
- butcher paper
- marking pens
- soil or compost thermometer

A Gift of Compost

Students build a compost pile to keep the garden fertile over time. The compost they make will be used by next year's class.

Outcome

Students apply what they know about how garden soil changes over time by building a compost pile.



For the Teacher

"Behold this compost! Behold it well! ...It grows such sweet things out of such corruptions...."—Walt Whitman

When plants and animals die in nature, they fall to the ground and eventually decompose, returning nutrients to the soil. When a garden is harvested, this natural cycle is interrupted. Composting is a way to mimic nature by returning unused plant materials back to the soil. We could just put pieces of fruits, leaves, and stems into the soil, but it would take a long time for the soil bacteria and fungi to break them down. By building a compost pile, we can speed up the natural decomposition process.

There are many benefits of composting. Compost not only replaces nutrients used by plants but also improves the garden soil structure by adding humus. Humus gives the soil body and makes nutrients and water more available to plants. Composting also allows students to see that organic matter such as food wastes and leaves can change, over time, into a valuable fertilizer that builds the garden soil. A healthy compost pile requires a balance of carbon and nitrogen. Carbon sources include woody, dry materials such as sawdust, straw, fallen leaves, and dry grass clippings. Nitrogen sources include green, wet materials such as fresh grass clippings, manures, and kitchen waste. Do not compost meat, bones, grease, or dairy products.

You can tell that the pile is ready when it is dark brown and looks like soil, is not made up of easily recognizable ingredients, and has an earthy odor. The outside of the pile will not fully decompose: You must check at least 15 cm (about 6 inches) into the interior of the pile. The process will take 2–4 months. For additional information on composting, please refer to *Gardening Know-How for the '90s*, p. 23.

Teacher to Teacher

It's incredibly rewarding when students come up with their own experiments to do. Two of my students set up a "reverse garden" by "planting" various types of waste in marked holes in the garden and then digging them up later to see which had decayed the most. This composting activity really brought out the what's-going-to-happen curiosity in them.

—Judy Billings, Redwood School, Boulder Creek, CA

Preparation

1. Choose a permanent area for the compost pile. A good location is close to the garden for easy hauling as well as easy access.
2. Collect composting materials. Help the class place the materials into separate lawn bags labeled Nitrogen or Carbon.
3. The actual building of the pile works best in smaller groups of up to ten students. You have a few options here. You might take the whole class outside and have one group of students make several layers of the compost pile while the rest of the class does other tasks in the garden; then switch groups. Alternatively, if you have enough composting materials and space, you might have each group build a separate pile. You may also conduct the activity as a whole class.
4. If possible, arrange for an aide or parent volunteer to help out.
5. Using the butcher paper and pens, make a class chart for recording the compost temperature over the next two weeks. Post it in the Life Lab Center.



Getting Started

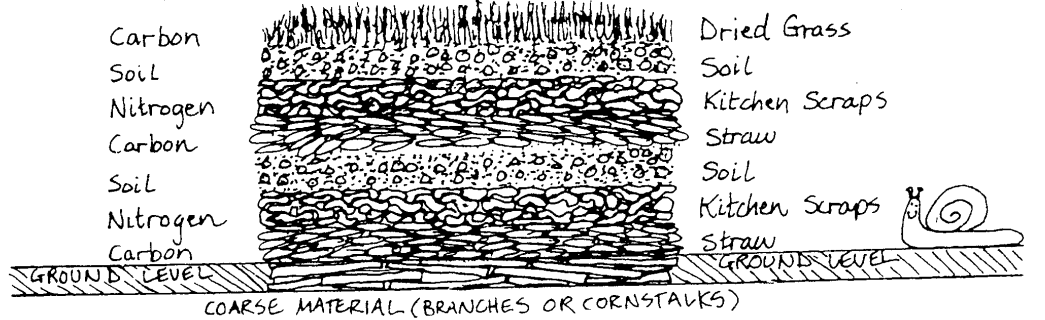
Lead a discussion to help students remember different ways that soil changes over time. Introduce the idea that a compost pile is one way to break down once-living material and return it to the soil.

In what ways does soil change over time? What are some of the things that make up soil? When we plant a garden, the plants use nutrients in the soil to help them grow. What are things we can do to replace these nutrients? When plants grow in the wild, they die and their nutrients return to the soil after decomposing and become nutrients for plants. When we harvest our garden we remove many of the nutrients that would naturally return to the soil. How can we use compost to make the garden last over time?



SAMPLE COMPOST PILE

This is the slow method of composting and will take 2-4 months to decompose.



Action

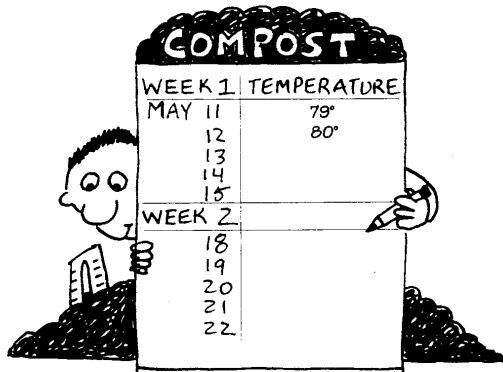
1. Divide the group or class into three smaller groups—Nitrogen, Carbon, and Soil. Each group will be responsible for adding that ingredient to the pile. Appoint a Waterer to sprinkle between layers and a Measurer to determine the thickness of layers as they are added. Choose two Straighteners to be in charge of straightening the sides of the pile.
2. Have students use their spading forks to loosen the ground where the pile will be. The area should be about 1.2 meters (about 4 feet) wide and at least 1.2 meters (about 4 feet) long. Depending on the amount of material the class has collected, the pile can be as long as you want to make it.
3. To make the pile, students layer materials in the following order:
Carbon (straw or dried plant matter)
Nitrogen (kitchen scraps, weeds, or manure)
Soil (topsoil or old compost)

If possible, the first layer should be a stalky material for good drainage—straw or corn husks work well. Instruct students to chop up materials with a spade as they add their materials to the pile. Each layer should be about 10–15 cm (4–6 inches) deep. After a layer is complete, the Waterer lightly moistens it.

4. Put the Straighteners in charge of keeping the corners square and maintaining the rectangular shape of the pile. This will help prevent the pile from collapsing.
5. Rotate groups after one round of layering carbon, nitrogen, and soil.
6. Repeat the layering until the pile is at least 1 meter (about 3 feet), but no more than 1.5 meters (about 5 feet), high.
7. When the compost pile is finished, have students measure and record its dimensions. Make a hole toward the center of the pile (at least 15–20 cm [6–8 inches] deep) and measure the temperature. Record the temperature on the class chart. Have students record the temperature every day for the next couple of weeks. Point out that this is one way to keep track of changes in the compost over time.

8. Ask the class how they think people can tell when compost is ready to use. If necessary, point out some of the signs (see For the Teacher).

9. Help the class write a note to next year's class to explain what the compost will be like when it is ready.



Assessment

Have students draw a picture of the compost pile and explain how compost will help the garden next year.

Why did you build a compost pile? What materials did you put in your pile? What happens in a compost pile? Why is compost good for soil? How long do you think it will take for the compost to be ready to use? (In temperate climates, a pile left to sit should be ready to use as soil enrichment in 3–4 months. In cold climates, the process may take longer—up to 6 months.) **How will our compost pile keep the garden going next year?**

Digging Deeper

- Have students predict which materials will decompose more quickly than others in the compost pile. Periodically during the composting process, have students take a sample from the pile to check their predictions.

- Help students compare decomposition rates in the pile in relation to rates outside the pile. For example, students might bury a tomato in the compost and leave one exposed to the elements.

- Using a soil test kit, test the garden soil for nutrients before adding compost. Pass this information on to next year's class so that they can test the soil after adding compost to determine how compost changes the soil.

Teacher Reflections

- Did students understand how compost piles help sustain the garden soil over time?

- Did students see the relationship between plants growing in soil and the need to replace soil nutrients?

- Have students grown in their ability to work together on a class project?

