Making a Classroom Composter

Grade Level: Grade K-4

Subject Areas: Science, Social Studies

Duration: 45 minutes to 1 ½ hours

Objectives

1. Learn how to set up a successful classroom composter
2. Learn about the process of biodegradation, what biodegrades and what does not.
3. Examine differences between carbon-rich and nitrogen-rich inputs to compost.
4. Discuss responsibilities toward the environment.
5. Take action to lesson one's environmental footprint.
6. Learn about worms, their biology, anatomy and function in ecosystems.

Background Information

Compost is the product of decomposed plant and animal matter. Dead plants and animals are broken down by earthworms, fungi, bacteria, and other soil microorganisms. Compost is often nutrient-rich and is therefore a useful soil amendment for gardens. Composting has been dated back to the ancient Romans, where piles of dead plants and animals were left in a heap for a year, and then spread on fields, as a natural fertilizer. "Natural" composting occurs in any natural environment such as fallen leaves in a forest, and it is nature's method of nutrient cycling. Leaves are turned into humus, an important component of soil, which provides nutrients to plants. Most of the decomposers need water and oxygen to live. It is therefore useful to keep the pile moist and turn or aerate the compost pile regularly to introduce more oxygen, thereby speeding up the process of decomposition. In one handful of rich soil there may be up to 5 billion bacteria. Without decomposers to recycle energy and nutrients, we would be buried in dead plant and animal matter, and life would cease on earth.

To have a successful compost, one must have a one to one ratio of carbon to nitrogen inputs. Carbon-rich inputs are often brown and dry such as dead leaves, straw, sawdust, shredded newspaper, brown grass clippings. Nitrogen-rich inputs include kitchen or lunch scraps, green leaves, and green grass clippings.

Vocabulary

Compost	Decomposed plant and animal matter which is often used by gardeners and farmers to enrich the soil.
Microorganisms	Living things that cannot be seen by the naked eye, but can be seen using a microscope. These include bacteria, fungi, nematodes and protozoa.
Fungi	Plant-like organisms, with no chlorophyll, which usually use dead plant

	and animals matter as food. (eg. Mushrooms, molds, yeasts, mildews)
Bacteria	One-celled organisms, found almost everywhere on Earth and can only be seen through a microscope
Earthworm	A commonly found worm in soils which helps mix and aerate soils by creating tunnels and digesting dead plant material and turning it into humus.
Humus	Decomposed dead plant and animal matter in soil that holds moisture and provides nutrients to plants.
Decomposition	The process of breaking up into parts eg. Leaves and dead plant and animals change into soil.

Materials

- Plastic tub or tote with lid, with drilled holes in sides and bottom for aeration and drainage
- Extra lid for tub to be placed underneath, to catch compost "tea"
- Playground Sand (not beach sand as it contains salt, which is harmful to worms)
- Topsoil
- Dead leaves
- Red wiggler worms from a compost
- Compost (food scraps, brown leaves)
- Newspaper for shredding (black and white is best)
- Spray bottle to moisten the compost
- Magnifying glasses and/or stereo microscope
- Tool such as a garden hand fork for aeration

Introductory Discussion

What happens to most of our garbage? Does nature produce garbage? Who recycles here? What do you recycle? Does anyone have a composter at home? What does a composter do? What animals live in a composter? What happens in the forest when a tree dies? Does nature recycle? (Optional: read all or some of *A Log's Life* by Wendy Pfeffer).

Science Activity/Experiment

This activity is often best done on the floor with students sitting in a circle. Each student gets several sheets of newspaper to shred. Shredding is best done if the newspaper is lengthwise. Strips should be about 2-3 cm wide. Strips can be placed at the bottom of the bin until covered. Then add kitchen/lunch scraps. Cover these scraps with some soil and red wiggler worms. Ask students why it is helpful to add some soil (inoculation of fungi and bacteria, as well as grit for worms to use to grind their food). Moisten bin contents with a spritzer bottle, until damp but not wet. It should have the consistency of

a damp sponge. Add more newspaper strips on top and dampen lightly with the spritzer bottle. The compost should be as moist as a well wrung-out sponge.

To avoid fruit flies and smells, make sure that there is always a layer of shredded newspaper on top and that food scraps are buried. Do not "overfeed" your bin.

Go over a list of items that can and cannot go into the compost bin. Eg. Fruit peels (in moderation), teabags, coffee grounds, eggshells, bits of uncooked veggie scraps etc. are good to put in. If food scraps are broken up or cut up, they will decompose faster. Do not put in meat, cheese, sugars, breads, oils and fats, etc into a class composter as they will not break down easily and will cause bad smells. Categorize items that go into the compost bin as either Carbon-rich (brown material) or nitrogen-rich (green, and coloured material).

Optional (add 30 minutes): Go over the function and anatomy of a red wiggler worm (best with an image or poster). Important points: worms breathe through their skin, they don't have lungs. They need moisture to breathe properly. Worms' skin is also sensitive to sunlight, salts and acids, which is why we need to be careful to not add too many citrus fruits or any salt to the compost. Worms have a small brain, a gizzard (instead of teeth), no eyes and 5 hearts! If you cut a worm in half it might live, but you won't make 2 worms because it only has a brain at one end. Worms are also hermaphrodites, which means they are neither girl or boy worms but both at the same time. You may opt to extend your discussion of worms to next class if students are interested (there is much information on Red Wigglers available online).

Have students return to their seats. Give each group of 2 students a petri dish (or small yoghurt container). Place a small amount of soil, a spritz of water and a worm in each dish (soil and water is to make the worm more comfortable). Let students observe the worms with a magnifying glass. Ask them for observations and inferences (i.e. is the worm trying to hide? Why? Can you tell which end is his head? How?)

Closure Discussion

How fast do you think our food scraps will turn into compost? How could we test how long it takes? What things might decompose very quickly? What might take longer to decompose?

Extensions

Discuss reducing waste in the classroom, in students' lunches, at home.

Visit local garbage dump or recycling plant.

Look at decomposition up close by placing bread slices in Ziploc bags and placing them in the dark for 1-2 weeks. Observe fungi and bacteria in action.

Show students dried yeast (inactive form), a type of fungi, then place in warm water with sugar added. Show students how yeast "comes alive", grows and gives off carbon

dioxide. Do this experiment in a small clear bottle and place a deflated balloon over bottle opening. Watch the balloon blow up.

Resources

Picture books

Pfeffer, Wendy. *A Log's Life*. Simon & Schuster, NY (1997).

Cronin, Doreen. *Diary of a Worm*. Balzer & Bray. (2003)

See our *Soils* lesson for other books related to this lesson.

Websites and brochures

City Farmer (Vancouver's Compost Demonstration Center) provides a wealth of knowledge online and in person on worm and backyard composting. See, for example, http://www.cityfarmer.org/wormcomp61.html

Want to learn more about worms? Here is a good resource: http://www.wormdigest.org/content/view/200/2/

Metro Vancouver's Guide to Worm Composting