



Lesson Plan Information

Name: Circular Economy – Composting

Grade: K-12

Topic: Students will learn about the importance of diverting food waste from landfills. They will learn how to setup and maintain a traditional compost bin and a worm compost bin. Students will learn how soil organisms recycle organic wastes through composting.

Time: 30-45 minutes for setup per bin, 30 minutes of weekly maintenance per bin.

Introduction:

Over one third of the food produced in the United States is never eaten. There is a value of roughly \$161 billion in food waste in America each year. That's enough money to buy around 8 billion pizzas! When we waste food, we also waste all the energy and water it takes to grow, harvest, transport, and package it. Where does all that unwanted food go? Mainly underground. Food waste takes up more space in U.S. landfills than anything else. Once the food is buried in the landfill, it breaks down, generating methane, a potent greenhouse gas that contributes to climate change. One way you can help the environment and combat climate change is by recycling your food waste into compost. Composting diverts food waste from landfills and generates a nutrient rich soil amendment that can be used for your house plants and in your garden. Composting is nature's way of recycling!

There are two types of composting, **aerobic** and **anaerobic**. Anaerobic composting does not use oxygen. The food waste is buried and covered and then broken down by anaerobic microorganisms. It is a much slower process of composting. An example of anaerobic composting is a landfill.

Aerobic composting uses oxygen. The aerobic microorganisms that feed on the food waste use carbon and nitrogen to grow and reproduce, water to digest materials, and oxygen to breathe.

In this lesson, you will learn how to setup two types of aerobic composting bins: traditional and vermicomposting. The traditional compost bin can break down materials without worms. It relies on high internal temperatures, bacteria, and other microorganisms to break down the organic material. Vermicomposting relies on worms to break down the food waste.

Key Terms:

Aerobic composting: The decomposition of organic matter using microorganisms that require oxygen.

Anaerobic composting: The decomposition of organic matter occurs where oxygen is absent or in limited supply.

Browns: In composting, browns refer to carbon rich materials. Examples include leaves, paper, and cardboard. Confusingly, not all “brown” is brown in color. Coffee grounds, for example, are rich in nitrogen and, in composting terms, is a “green.”

Circular economy: A model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials, and products as long as possible.

Composting: A controlled, aerobic (oxygen-required) process that converts organic materials into a nutrient-rich soil amendment or mulch through natural decomposition.

Compost: Decayed organic material used as a plant fertilizer.

Carbon: Provides the energy source for the microbial cells that turn waste into compost. Carbon rich materials need to be mixed with nitrogen for effective composting.

Compost worms: Species of worms that are used in the composting process. The most well-known is the Red Wiggler (*Eisenia fetida*).

Greens: Compost materials that are high in nitrogen. The term green refers to the nitrogen level, not the color. For example, used coffee grounds may be brown in color but they are high

in nitrogen, and referred to as a “green.” Examples of green materials are vegetable scraps, apple cores, banana peel, and carrot tops.

Grit: Worms need “grit” to help them digest the food waste. Soil, coffee grounds, and crushed eggshells can be placed in the bin to provide the worms with grit.

Microorganism: A microscopic organism that breaks down organic materials into nutrients.

Nitrogen: An important nutrient utilized by plants. Nitrogen is also used to grow protein in the microorganisms in compost.

Vermicomposting: The process of using worms to break down organic waste into material containing nutrients for plant growth.

Worm Castings: The undigested material, soil, and bacteria excreted by the worm (worm manure). The finished compost will look dark brown and black in color.

Materials:

Kit will include:

- Plastic bins with locking lids (2)
- Coco coir for bedding for worm bin
- Voucher to order red wiggler worms for worm bin
- Rake with rounded teeth for mixing and turning compost
- Compost pail with lid
- Plastic water spray bottle
- Puppy pad to place beneath traditional compost bin
- Digital humidity and temperature thermometer for traditional compost bin
- Poster



*Videos and additional information
can be found on the DFW Earth
Day website*

Additional Materials Needed:

- Water
- Soil
- Shredded cardboard, paper, and dried leaves
- Food waste
- Black construction paper

Procedure:

Setting up your traditional compost bin:

1. The bin has pre-drilled holes at the bottom and on the sides to help with air flow and drain excess moisture. Place the bin on top of the puppy pad to absorb any excess moisture that might drain from the bin.
2. The first layer in the bin will be a brown layer. Place a layer of dried leaves, shredded cardboard, and shredded paper in the bottom of the bin (2-3 inches thick).



3. Add a layer of soil on top of the brown layer (approximately 1 inch thick). The natural microorganisms in the soil will accelerate the composting process and help mask any odors.
4. Now add the green layer of food scraps that you have collected in the compost bucket. (1-2 inches thick). Before adding the food scraps, make sure you chop them up very finely, as this will help them to break down faster. By building layers in your compost, you will successfully combine all the essential components (nitrogen, carbon, water, and oxygen) to promote proper decomposition. Greens and browns need to be layered in the proper proportions. Too much wet green material can make your bin too soggy. And too much dry brown material will dry it out. When adding browns and greens to your pile, add at least two to three times the volume of browns (such as dry leaves and shredded cardboard) to the volume of greens (such as food scraps).
5. Use a small shovel or rake to mix the layers together.
6. After mixing add a thin layer of soil and then another brown layer on top. This will help keep fruit flies away!



7. Keep your bin a dark area such as a closet or under the sink if possible. Too much light will slow down the decomposition process.
8. Mix your compost every two to three days, as this will add more oxygen and aerate it.



9. As the food waste begins to decompose, you can add another green layer and mix it in. Then add another brown layer. Stop adding layers once the bin has become two-thirds full. If the bin is too full, you will not be able to mix it and it will lack air flow.
10. If the bin seems too wet, place a layer of shredded cardboard on top to help absorb some of the excess moisture. If the bin seems too dry, mist with water or add wet shredded paper to the top.
11. Traditional composting uses heat to break down the food waste. The temperature and humidity inside the bin will be higher than outside the bin. Use the digital thermometer to monitor the humidity and temperature in the bin. Record the humidity and temperature outside the bin. Remove the lid and lay the thermometer on top of the compost. Quickly place the lid back on to avoid letting any heat escape. Record the humidity and temperature inside the bin.
12. You'll know the compost is ready when few (if any) scraps can be identified in the compost material, and it gives off a slightly sweet, earthy odor. Finished compost looks like soil, with a dark color and fine texture. Allow your compost to cure, or finish, for at least four weeks before using it in your garden.



Setting up your worm compost bin:

Complete steps one through three before the worms arrive in the mail. Place the worms in the bin as soon as possible after they arrive. If you suspect the worms are dead when they arrive, contact Urban Worm Company at 833-872-6976, or email support@urbanwormcompany.com.

1. The bin has holes pre-drilled into the sides and top to provide oxygen for the worms and help drain excess moisture.
2. The first layer in the worm bin is coco coir bedding. This is the brown layer. Hydrate the coco coir by placing the brick in a bucket and adding enough warm water to absorb into the brick without runoff. After about 20 minutes, break the brick apart with your hands until it is light and spongy. You should be able to squeeze out about two or three drops of water from a handful of coco coir. Place about 3 inches of hydrated coco coir into the bottom of the bin.



3. Place a 2-inch layer of soil on top of the coco coir to provide the worms with grit.
4. Next add the worms to the bin. The worms are shipped in a small bag. When you remove them from the bag it will look like a dry ball or clump of soil. Believe it or not, there are about 500 red wiggler worms in that ball! They are in a slightly dehydrated form so you will need to add about a ½ cup of worm water to the bag to rehydrate them. Then dump the bag of worms on top of the brown layer and cover them with a layer of damp shredded cardboard and/or paper. The worms will burrow down into the coco coir on their own. Place the lid on the bin and place it directly under a light for a minimum 24 hours. When the worms arrive, they are restless and will sometimes try to escape the bin. Worms prefer darkness and the light will encourage them to burrow into the coco coir and stay there. Once they are used to the new home, they will settle down.

5. You can feed the worms after two days. Add a green layer of food scraps that you have collected in the compost bucket. (1-2 inches thick). Before adding your food scraps, be sure you chop them up very finely because this will help them to break down faster and make it easier for the worms to consume. Worms may not eat very much for the first week as they are adjusting to their new home. Wait to add more food until the worms have begun to feed on the existing food.



6. Add a thin layer of soil or coco coir bedding on top of the green layer to help keep fruit flies away.
7. If the bin seems too wet, place a layer of shredded cardboard on top to help absorb some of the excess moisture. If the bin seems too dry, mist with water or add wet shredded paper to the top.
8. Worms like darkness, so keep the worm bin away from bright light. Create a screen with black construction paper to cover the sides of the bin, as this will encourage the worms to come to the surface layer to eat. You will see the worms on the sides of the bin when you remove the paper.
9. After the first week, your worms should be settled and start eating well. You can then feed the worms two or three times a week. Adjust the amounts and frequency based on your observations on how quickly the worms are eating. Only feed what your worms can eat! Use the rake included in your kit to gently move the bedding and food waste aside to check on your worm's progress.

10. After about two or three months, your worm compost or worm castings should be ready to harvest. There are several methods for harvesting the castings. Here is a link for a video on how to use the “Dump and Hand Sort” method. [Harvesting Worm Castings - YouTube](#)



Key Take Aways:

After completing this activity students will:

- Learn about the benefits and uses of compost.
- Be able to identify the differences between what can and cannot be composted.
- Improve observation skills.

Links/and Videos on Food Waste and Composting:

<https://www.epa.gov/recycle/preventing-wasted-food-home>

[The A-Z of Composting | Compost Magazine](#)

[17 Surprising Composting Statistics to Know \(2022\) \(coopeduplife.com\)](#)

[Kids And Composting - Compost Activities for Kids \(gardeningknowhow.com\)](#)