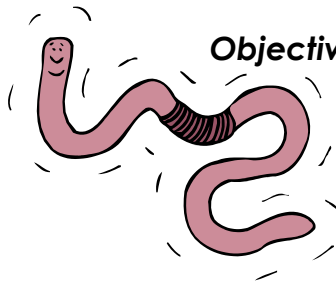


Composting with Worms in the Classroom

(Vermicomposting)



Educational Farm & Nature Preserve



Objective: Design, build and maintain a worm composting bin. Observe the changes in the system and make connections about what is happening in the bin to what is happening in nature.

Background: Worms are great. They eat their weight in organic matter every day and poop it out as “castings”—a great fertilizer high in nitrogen, phosphorus, and potassium.

Materials:

- **A bin** (A wooden box, plastic tub, or metal bin will all work. The secret to an odor-free bin is good air circulation. A shallow bin with a larger surface area is best, with drainage holes in bottom. Raise bin on blocks or bricks and place tray or plastic sheet underneath to catch liquid. Cover the bin, but either leave lid slightly ajar or drill holes so air can get in.)
- **Biodegradable bedding** (Material must be lightweight and free of chemicals. Reuse old computer paper or newspaper by tearing it into thin strips. Do not use colored or glossy paper. You can also shred cardboard and use as bedding. You can create an even better environment for the worms by adding a bit of peat moss, crushed eggshells, or a handful of soil or sand to the paper bedding.)
- **Food** (Could include food scraps, coffee grounds/filters and tea bags (remove any metal first), crushed egg shells or spoiled food. Break down large pieces

Did you know?

One pound of worms can chew up ½ of a pound of food waste every day!

before putting it. Avoid meat and dairy, as it will smell rotten quickly. Limit the amount of citrus, and do not add anything that is not biodegradable.

- **Worms** Red worms (red wigglers) work well. The amount you need depends on the amount of food waste you plan on putting in. One pound of worms can take care of ½ pound of waste being put in per day.
- **Journals** (optional, to record predictions and observations over time)

ODE Common Core Model Tie-In:

Grade 1 Life Science

Topic: Basic needs of living things

Concept: Living things have basic needs, which are met by obtaining materials from the physical environment.

Grade 2 Life Science

Topic: Interactions within Habitats

Concept: Living things cause changes on Earth.

Grade 5 Life Science

Topic: Interconnections within Ecosystems

Concept: Organisms perform a variety of roles in an ecosystem.

Helpful vocabulary:

- **Compost**- organic materials mixed together
- **Vermicomposting**- the process of composting using worms and microorganisms
- **Organic**- part of an animal or plant
- **Decompose**- to rot or break down
- **Humus**- the finished product from composting
- **Worm castings**- worm poop that is rich in nutrients

Procedure:

Find a worm source ahead of time. You could order red worms (also called red wigglers) online, through a lawn and garden catalog, or they are sometimes found at a bait store.

Depending on the age of students and time constraints, you could discuss as a class what type of bin and bedding you'd like to use and possible places to gather the materials. Share the information in the "materials" section with students so they can consider how the bin should be prepared (drainage, etc). In a classroom, there is usually lots of scrap or used paper that ends up being thrown away. While discussing bedding options, students may come to the conclusion that they could save this paper and reuse it by tearing it into small strips for the worm bin.

Once the bin is ready, place the bedding in it. A bin should be about 2/3 filled with "fluffed" bedding. Use a spray bottle to moisten the bedding. Remoisten whenever the bedding begins to dry out.

Decide how you want students to track the changes they see in the worm bin. Photos, drawings, or journals are some options.

Once a recording plan is in place, you're ready to add the worms and slowly add food. It will take time for helpful bacteria to build up, so you don't want to add too much food waste at a time. How much you can put in per day will depend on how many worms you have. One pound of worms will take care of ½ pound of food. The worms can also eat the bedding. Break food into small pieces and burying it in bedding. See materials list above for suggestions about food.

"Fluff" compost each day with small shovel or hands. This allows air to circulate. Over time, you will begin to see humus- a rich, black soil rich in nutrients. If your school has a garden, have the kids put this on the garden beds. If not, you could bring in some potted plants for students to add the new soil to. Talk about how this helps the plants, because plants need nutrients to grow just like we do.

Worm Bin Troubleshooting:

If you have a problem with your worm bin, it is a great opportunity to have students analyze the problem and create solutions. Here are some more common issues and how to solve them.

Fruit flies: Avoid putting rotten food into bin. Cut food scraps into smaller pieces so worms can eat food more quickly. Don't overfeed worms, as then food will sit around longer and attract flies. Bury food in bedding. Do not keep the bin too wet. Limit citrus fruits. Add a loose sheet of newspaper on top of worm bin contents. Wash fruits and peels before putting into bin in case they have fruit fly eggs on them.

Odor: The bin may be too wet. Avoid watery foods such as melons and add more bedding. The bin may not be getting enough air circulation, causing anaerobic bacteria. Mix contents daily and add fresh bedding. Some foods, such as onions and broccoli, do not smell good as they decompose. Remove those foods. Meat, bones, dairy, and oily products will smell rancid as they decompose. Do not add these to your bin.

Worms Dying: Bin may be too wet and worms are drowning. Drain, add fresh bedding (slightly moist, but not wet, as the bin could also become too dry, causing worms to dry out.) Bin may not get enough air causing worms to suffocate. If the worms are dying and they've eaten most of their food and bedding, this means they are not getting enough food. Extreme temperatures can also cause worms to die. Keep in room anywhere between 55 to 80 degrees Fahrenheit.

You will know your bin is healthy if:

- ✓ It smells earthy
- ✓ Bedding disappears over time and more needs to be added
- ✓ Worm castings are piling up
- ✓ Worms have glistening skin
- ✓ Bin filled with fluffed up, shredded paper
- ✓ Bin has some other organisms, such as mites (in *small* quantities)
- ✓ Fuzzy mold on some foods
- ✓ Contents are damp but not soggy
- ✓ Food is not visible when you open bin

Further learning suggestions/extensions:

The worm bin can lead to great critical thinking discussions with students. What would happen if there were no worms in the ground outside? What things might be harmful to worms? Students can also learn about what is organic material vs. non-organic material. Why is it important that only organic material be put into the bin? How does this apply to our gardens/earth?

Students could research more about worms, or other ways that organic materials break down.

Here is an experiment that is easy to set up once you already have worms!

The goal is to compare two boxes of organic materials, one with worms added and one with no worms. This will demonstrate how worms can help create good soil by mixing parts of soil together.

Use two clear plastic containers, adding the same amount of soil, compost and/or leaves to each. Keep the materials moist but not too wet. Add worms to one of the containers. Have students describe/draw pictures of the soil in both containers. Then cover the containers with black cloth or paper. Make small holes to allow air flow.

Students can predict what will happen over time. What will be the differences between the two containers?

Remove the black cloth daily over the course of a few weeks to observe the soil in each container. Have students' record observations. Keep the soil in both boxes equally moist.

After a few weeks, compare and contrast the soil in the two containers. What effect did the worms have on the soil? How did you know the worms were changing the soil? What was the purpose of the "control" box with no worms? How do the worms act like a tiller? How is the worm able to recycle materials in the environment?

Put worms back into main worm bin once finished with experiment.