Worm Composting

Materials:
- Red Wiggler Worms
- Small Tupperware-like containers with lids
- Larger, waterproof container like a 10 gallon bucket or larger storage bin
- Water source
- Newspaper
- Vegetable food waste
- Safety pins/scissors
Optional:
- Larger, complete worm composting bin
- Dried flowers, leaves, rocks
- Rulers
- Science Notebook
- Scale

Standards and Curricular Connections:

Next Generation Science Standards

4-PS3-3 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another

4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Overview & Objectives

Vermicomposting, composting with worms, is an excellent way to connect to the garden in the winter. Composting reinforces lessons on habitat, plant needs, and decomposition. It also provides a hands-on demonstration of multiple forms of energy and nutrient cycling. If successfully maintained, vermicomposting will produce worm casting, a nutrient rich fertilizer for the school garden.

The most difficult part of vermicomposting is obtaining the initial supplies. While earthworms can be interesting to study during a singular class period, red wiggler worms should be used if the worms will be kept overnight. Red wiggler worms can be found at bait shops, online, or a friend’s worm bin. All other supplies can be found in the recycling bin, classroom, or dollar store.

Students Will:
- Create their own mini composting bin habitats, meeting the worm’s survival needs.
- Identify the types of energy involved in composting
- Recognize the steps of decomposition in action

Pre-Activity Questions:
1. How many students have touched or held a worm before?
   Where do we usually find worms?
2. What is decomposition? What would happen to fallen tree leaves if we left them on the ground?
3. How do plants and animals get their energy to grow?
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Strategies for Engagement:
- Feed the worms half their bodyweight a day i.e. a pound of worms can eat half a pound of food waste in a day.
- Only plant based food waste should be put in the worm bin. Typically, raw, unprocessed food works the best. Freeze or microwave food waste to kill off any aphid eggs. Return to room temperature before adding to the worm bin. Experiment with different types of vegetables and fruits to see the affect on the worm castings.
- It is cheaper to buy larger quantities of worms online, Gateway Greening has used Uncle Jim’s Worm Farm (www.unclejimswormfarm.com) in the past. Local bait shops work if you are buying a smaller amount of worms.

Resources:
- University of Missouri Extension Office
- Compost Stew: An A to Z Recipe for the Earth by Mary McKenna Stables
- Wormology by Michael Ross
- http://www.in.gov/idem/iee/2367.htm
- http://compost.css.cornell.edu/worms/basics.html

Activity:
- Introduce the concept of vermicomposting - worms eat plant waste and turn it into castings (worm poop). If possible, have a completed, larger composting system available to demonstrate all the components. Have students feel the "soil" in the the bin and guess what it is (it is worm castings).
- Using observations and previous knowledge, students brainstorm worm survival needs – food, water, oxygen, and space.
- Divide students into groups with their own small lidded plastic container. Give each group a safety pin to poke holes in the lid to meet the worms’ need for oxygen. (Depending on grade level and ability, the teacher could do this beforehand.)
- Create space for worms. Tear newspaper into long strips and soak briefly in water. Squeeze out excess water and the newspaper should feel like a wrung out sponge - this provides water for the worms. They can also add small amounts of soils, leaves, and rocks to create personalized worm habitats.
- Pass out to each group plant-based food waste, like apple cores or banana peels from lunch, to be food for the worms. Start off with a very small amount and add more later, as needed. Chop or tear the food into small pieces to help the worms decompose the food quickly.
- Pass out 2-3 red wiggler worms to each group. Students write down several observations of the worms, using a ruler or scale if available. Each group should make a prediction of what will happen to the worm’s food and the worm over the next week.
- Leave the worm bin in a warm, dark spot in the classroom. Check the bins halfway through the week. Add spray extra water on the containers if the soil and newspaper are dried out. Add additional food scraps if they decompose.
- After a week, break the students back into their small groups. Observe the worm bins and record any changes to the worm’s condition, food, or habitat. Again, weighing and measuring the length of the worms if tools are available.
- Share observations and have them decide why these changes are occurring. Where did the food go? Where did the nutrients and energy in the food waste end up? (The worm ate the food, decomposition occurred, and compost was created).
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Additional Activities & Follow Up:

- Reference previous classroom lessons on energy to connect worm activity to different forms of energy. For example, worms use mechanical energy when moving, create thermal energy when moving, and use the chemical energy from the food waste to power their movements.
- Combine all of the students’ smaller worm bins into a large shallow container with a lid. The bin should be at least twice as wide as it is tall, and have holes in the lid. Add additional newspaper, worms, and food scraps to create an efficient way to dispose of snack time waste. In a few weeks, the bin will have castings that the class can add to the garden.
- Join the Composting Challenge at Gateway Greening to see if your school composts the most food waste! Have the students create informational posters to put up in the cafeteria to share with other students why they should compost. At least once a week, collect raw, vegetable and fruit waste from the cafeteria. Weigh the food scraps and add to the worm bin or outdoor compost pile.
- Have the students create a multi-paneled cartoon about what happens to a piece of food waste when it is put into a worm bin or a trash can. Compare storyboards and investigate where energy escaped each system.