

GARBAGE-EATING WONDER WORMS – Lesson 2

Follow-up lesson on compost made by red wiggler worms: hands-on observations of compost and red wiggler worms; students separate worms from the compost and add compost to schoolyard gardens.

OBJECTIVES

- Allow students to observe and touch the compost made by the red wigglers in the composting bin that the students set-up in the previous lesson.
- Give students an opportunity to add the compost to a school garden.
- Reinforce concepts taught in the first lesson about recycling, composting and waste reduction.

INTRODUCTION (5 minutes)

- Begin with students seated at their desks.
- Introduce yourself and remind students about your prior visit.
- Show students examples of the materials they used to create their worm bin earlier in the school year. Ask students if they remember making a prediction about what the worms would eat first (a stick, lettuce or newspaper). They will have a chance to see what happened when they observe the compost.
- Explain that the worms have been doing their job. Ask students, “**What was that job?**” Turning food waste into new soil. (As in Lesson 1, we are using the word ‘soil’ instead of ‘compost’ to simplify the lesson for first graders.)
- Ask, “**What do you think this new soil is going to look like?**”
- Explain that students have 3 science jobs today:

1. Make careful observations

2. When instructed, very carefully **separate the worms from the soil**. Give your first demonstration of how the students will carefully remove the worms from the compost – one at a time – and place them in the yogurt cups. Remind the students that the worms DO NOT LIKE to be handled so they should not hold them for more than a few seconds.

3. Spread the soil made by the worms in a school garden.

- Explain your expectations for student behavior when you pass out the worms for observation.

ACTIVITY 1 - Discussion (10 mins)

Why compost? Have students brainstorm ideas why composting might be beneficial. Here are some ideas:

- Saves water by helping the soil hold moisture and reduce water runoff
- Benefits environment by recycling organic resources while conserving landfill space
- reduces the need for commercial soil conditioners and fertilizers
- Adds nutrients and beneficial microbes, holds water, and improves plant growth
- increases soil organic matter
- encourages healthy root structure
- lightens clay soil and helps sandy soils hold water
- attracts and feed earthworms and other beneficial soil microorganisms
- helps balance pH

- helps control soil erosion
- helps protect plants from drought and freezes

Where do earthworms fit into the ecosystem? Recall, we did the food web activity.

Earthworm info: *Earthworms are sometimes known as ‘ecosystem engineers’ because they significantly modify the physical, chemical and biological properties of the soil profile. These modifications can influence the [habitat](#) and activities of other organisms within the soil ecosystem.*

Earthworms influence (and benefit) the soil ecosystem in a number of ways:

- *Recycling [organic](#) material: Earthworms, along with [bacteria](#) and [fungi](#), decompose organic material. Most people know about earthworms and compost, but earthworms do the same in pasture soils, decomposing dung and plant litter and processing 2–20 tonnes of organic matter per hectare each year, and recycling leaf litter under orchards and in other forested areas.*
- *Increasing nutrient availability: This happens in two ways: by incorporating organic materials into the soil and by unlocking the [nutrients](#) held within dead organisms and plant matter. Nutrients like [phosphorus](#) and [nitrogen](#) become more readily available to plants after [digestion](#) by earthworms and being excreted in [earthworm casts](#). Scientists have measured up to five fold increases in nitrogen availability in earthworm casts compared to undigested soil. Earthworms also take nutrients down through the soil profile, bringing them into closer contact with plant roots.*
- *Improving [soil structure](#): Earthworm burrows alter the physical structure of the soil. They open up small spaces, known as [pores](#), within the soil. When earthworms are introduced to soils devoid of them, their burrowing can lead to increases in water infiltration rates of up to 10 times the original amount. This brings water and soluble nutrients down to plant roots. Burrowing also improves soil aeration (important for both plants and other organisms living in the soil) and enhances plant root penetration.*
- *Providing food for predators: Earthworms, like all creatures, are part of food webs. Birds are well known predators, but [native](#) earthworms are also food for [endangered](#) and [endemic](#) land snails.*

ACTIVITY 2 – WORMS AND COMPOST OBSERVATIONS (15 minutes)

• **Pass-out and review the worksheet.** It may be helpful to show an example of a completed worksheet. Explain that they can draw a worm, but this time you want them to focus on what the new soil looks like and what they are observing in the compost, such as egg sacs, new soil and partially decomposed materials.

Recall what went into the compost bucket the first day. What do you predict will happen to the things that went into the bucket?

Observation of the stages of the worm life cycle. Look for the following in your bucket:

- A worm cocoon. It is the size of a grain of rice and shaped like a lemon. Over time, the cocoons change color from white to yellow to brown. Students might have difficulty locating worm cocoons, so if a student finds one, make sure that the whole class gets to see it.

If your worm bin was set up recently, your students might not find any worm cocoons.

- Baby worms. They are whitish in color.

- Adult worms.

Info about worm life cycle: *Did you know that worms are “hermaphrodites?” That means that each single worm has both male and female reproductive parts. This is one of the coolest facts about worms! Worms have a band around its head, which is called a clitellum. This is where both reproductive organs exist. Their heads will face in opposite directions and they will put their clitellums together. Sperm will pass from one worm to another and it will be stored in sacs. After this step is done, a cocoon will form on each of the worms. The cocoons will each hold about one to five baby worms and the conditions are very important in order for the cocoons to hatch. It has to be dry and the cocoons can keep for years until the conditions are just right before hatching. As soon as the baby worms hatch, they are only about a half an inch long and they are white in color. Worms do not nurture their young and as soon as the baby worms are born, they will start eating. In about four to six weeks, the entire life cycle will start over again! It does not take long for the baby worm to grow into a full adult. One of the most amazing things about worms is that they can live for years and years as long as the climate and conditions are right. Worm’s bodies are roughly made up of ninety percent water and one of the ways that a worm will die is because of the water drying up! One of the coolest things about worms is that when they die, their body just becomes part of the **compost** in the soil and throughout their life and death, they are helping the soil one way or another!*

ACTIVITY 3 – SEPARATING WORMS FROM COMPOST (10 minutes)

- When students have finished the worksheets, direct them to put worms and larger pieces of uncomposted material into the yogurt cups that you are going to pass out.
- Demonstrate again how to very carefully pick up the worms with the spoon and put them in the yogurt cup.
- As students finish, empty the yogurt cups back into the worm compost bin and return the yogurt cups to the students.
- Direct the pairs of students to put half of the soil remaining in their bowls into the yogurt cup, using the spoon, so that each student has soil to spread in the garden. (One student will carry a yogurt cup and the other will carry the bowl for Activity 4.)

ACTIVITY 4– SPREADING THE COMPOST IN A GARDEN OR AROUND A TREE (10 min)

- Ask the teacher to have students get their coats, if necessary, and line up at the door with their yogurt cups and bowls of soil.
- Lead students to the garden. Have a few students at a time spread their soil on the garden.
- Discuss how the new soil will help the plants. The new soil contains a lot of nutrients that were in the food wastes that were composted.

§ Nitrogen is necessary for the plant to make new leaves, etc. since it is a building block of proteins and DNA.

§ Phosphorus is also a building block of DNA and it encourages root growth.

- The new soil also helps to keep the garden soil loose and helps water soak into the soil. This makes it easier for roots to grow and provides better habitat for soil animals. You can show students pictures of soil animals that might be living in the garden. If you have enough time, look for soil animals.

Activity 5 - Dirt compost cups

Materials

- Paper cup
 - Scissors
 - Toothpick
 - Fork
 - Assortment of candy to represent composting materials:
- Oreos (for dirt)
 - Pudding (for mud)
 - Runts (fruit)
 - Gummy worms (earth worms)
 - Swedish Fish (fish)
 - Cadbury Cream Egg (egg shells)

Activity

1. Crush up the Oreos plate and create a thin layer on bottom of the paper cup. Explain that in order to make a compost pile, the composting materials must have contact with the soil.
2. Use the toothpick to poke holes in the cup. Explain that a compost bin needs plenty of airflow.
3. Give each child pudding, runts, gummy worms, and Swedish fish as composting materials
4. Explain what each represents. Ask children if they think it should go in the composting bin.
5. Put composting materials in the cup and non-composting materials to the side.

Composting Materials

Oreos (for dirt)

Pudding (for mud)

Runts (fruit)

gummy worms (earth worms)

Cadbury Cream Egg (egg shells)

Non-Composting Materials

Swedish Fish (fish)

1. Once you have placed all composting materials in the paper cup, tell children to turn the candy over with their fork. Explain that a compost pile must be turned once a month so that air can get in and break down the materials.
2. Encourage kids to keep turning the materials with their fork. When the candy looks well mixed in the pudding, explain that the compost becomes dirt for the garden!
3. Now kids can eat the candy mixture!