Grades 3 & 4

# Manure and Microbes

LESSON 8

## Objectives

**The students will:**

- Identify the role of microbes in an ecosystem.

## Materials

- *Mighty Microbes* student page
- Trash items (both food and non-organic)
- Glass jars (e.g. possibly empty spaghetti sauce jars with labels removed)
- Soil to fill jars
- Metal tube (e.g. a coffee can)

## Procedure

1. **Ask students to recall what kinds of animals Zadou's family has in *Winter in Songming* (chickens and pigs).** Discuss the benefits that these animals might provide. Ask them: could they provide Zadou's family with fruits and vegetables?
2. **Tell the students that when an animal eats food, the parts that its body cannot utilize are carried out of the body in the form of manure.** Animal manure is an extremely useful product. For example, it can be made into fertilizer to help improve crop growth, or it can be used to create methane fuel for cooking (instead of having to use firewood, which might be in short supply).
3. **Composting is the process in which microbes break down organic waste (such as manure) into their basic nutrient parts that can be used as fertilizer.** Have the students read *Mighty Microbes*.
4. **To see the work of microbes, examine a core sample of soil:** (you may choose to do this ahead of the class period OR students can take samples)
   a. Take an empty metal can or tube (preferably at least 10" long).
   b. Go to a park or playground to find soft, moist, healthy, soil. A location with a lot of rotting leaves would work well.
   c. Place the open side of the can into the soil and gently rotate the can so it cuts through the soil. Try to get the can or tube as deep as you can before removing it from the soil.
   d. Gently lift the can or tube so the soil remains in one piece. Examine your core sample of soil. The top layer should be darker than the rest. This dark layer is the topsoil. The dark color comes

## National Standards Addressed

**COMMON CORE LANGUAGE ARTS**

**Reading**

**RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

**RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea.

**RI.3.4** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3/4 topic or subject area*.

**Speaking and Listening**

**SL.3.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3/4 topics and texts, building on others' ideas and expressing their own clearly.

**SL.3.2** Determine the main ideas and supporting details of a text read aloud or information presented

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## Procedure (continued)

from the nutrients that microbes have broken down from organic material (such as leaves and twigs). It is this topsoil layer that is most important for healthy plant growth.

5. **To see microbes in action, have the students do the following experiment over the next month or more.** You may choose to have each student do one jar, or just have a few jars for the whole class.
   a. Provide students with a small piece of trash. Have a variety of organic and non-organic waste.
   b. Have the students place an item of trash into a glass jar, up against the side of the jar.
   c. Fill the rest of the jar with just enough soil to cover the trash. Do not cover the jars.
   d. The soil should be lightly watered each day with just enough water to keep the soil damp.
   e. Have the students observe which items decompose fast, which ones take longer to decompose, and which ones do not decompose at all.
6. **Discuss (or ask students to write about) the following questions:**
   a. What made the items decompose?
   b. How did the microbes get into the jar?
   c. Why do some items decompose faster than others?

## Links To Heifer International

**Use of manure as fertilizer**
When Heifer International provides people with livestock, it also trains them how to use the manure as fertilizer. This knowledge is part of the training that the gift recipient must pass on along with the first female offspring of their animal. Heifer taught Zadou's family to collect the manure to use as fertilizer to improve their crop growth.

## Standards (continued)

in diverse media and formats, including visually, quantitatively, and orally.

**Writing**

**W.3.7** Conduct short research projects that build knowledge about a topic.

**W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories

**NEXT GENERATION SCIENCE STANDARDS**

**ESS2.E Biogeology**

Living things can affect the physical characteristics of their environment.

**LS1.C Organization for matter and energy flow in organisms**

Food provides animals with the materials and energy they need for body repair, growth, warmth, and motion. Plants acquire material for growth chiefly from air, water, and process matter and obtain energy from sunlight, which is used to maintain conditions necessary for survival.

**LS2.A Interdependent relationships in ecosystems**

The food of almost any animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.

**LS2.B Cycles of matter and energy transfer in ecosystems**

Matter cycles between the air and soil and among organisms as they live and die.

**LS4.C Adaptation**

Particular organisms can only survive in particular environments.

**PS3.D Energy in chemical processes and everyday life**

Energy can be "produced," "used," or "released" by converting stored energy. Plants capture energy from sunlight, which can later be used as fuel or food.

**SOCIAL STUDIES**

**D2.Geo.4.3-5.** Explain how culture influences the way people modify and adapt to their environments.

Name_____Date_____

# Mighty Microbes

Composting means the breaking down of living materials so that they are available for another use. Composting is done by tiny creatures called microbes. Microbes are decomposers, an important part of an ecosystem.

Microbes are too small to see without a microscope. Hold up one teaspoon of soil. There are more than a million microbes on that teaspoon. In one shovel full of soil, there are more microbes than the number of humans that have ever lived.

Make a dot with the tip of your pencil here:  The dot you've just made is much larger than one microbe!

Like all living things, microbes need food. Microbes can eat many kinds of things, including animal manure. When they eat manure, they release nutrients from the manure including nitrogen, phosphorus, and potassium. These nutrients can then go back to the soil. These are the nutrients that plants need to grow. Without decomposers like microbes, nutrients eaten by animals would never be returned to the soil, and plants would be unable to live and provide food to the animals. That's why microbes are so important to ecosystems- and to us!

Microbes are living things. They need oxygen, water, and the proper temperature, or they might die. Because microbes work so hard at composting, some farmers call microbes their most important livestock.