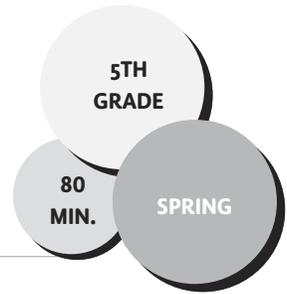


Rotting Away, Day by Day

THEME: EXPLORING THE ECOLOGY OF FOOD



Session 1: 45mins

Session 2: 35mins

ESSENTIAL QUESTION

What factors affect how quickly an object will decompose?

LEARNING OBJECTIVES

- ✓ Students will be able to explain the process of decomposition.
- ✓ Students will be able to make predictions about the rate of decomposition.

CONCEPTS

characteristics environmental factors
organic matter rate of decomposition

Engaging the Classroom Teacher

- Prior to the lesson, schedule a day for the second session at least two weeks after the first.
- During Action Step 2, suggest that the teacher circulate through the garden to support students during the scavenger hunt.
- During Action Step 4, suggest that the teacher supervise students as they find an object to bury and fill out their worksheet.
- During Action Step 7, suggest that the teacher supervise students as they unearth their objects and fill out the second part of their worksheet.

LESSON DESCRIPTION

In this lesson, students look for signs of decomposition in the garden, consider the various factors that influence the rate of decomposition, and then bury a specific object that they unearth a couple weeks later to observe. This lesson can be taught in conjunction with FoodCorps lessons Break it Down and The Nutrient Cycle.

MATERIALS

- Pencils
- Magnifying glasses (optional)
- For each pair of students:
 - Decomposition Scavenger Hunt Worksheet (p. 600)
 - Observing Decomposition Worksheet (pp. 601-603)
 - Clipboard
- Popsicle sticks, paint stirrers, or found sticks for each student
- Permanent markers
- Masking tape
- Trowels
- Butcher paper or newspaper on which to place decomposed objects during Session 2
- Rocks to weigh down the butcher paper or newspaper
- Garden gloves for students (optional)

PREPARATION

Session 1

- › Create a model identification tag by wrapping a piece of masking tape with your name written in permanent marker around the top of a stick.
- › Find something in the compost pile or elsewhere that is intensely rotting and perhaps has an “ick” factor.
- › Identify beds or sites in the garden where students can dig freely to bury their objects.
- › Photocopy Observing Decomposition Worksheet for each student
- › Photocopy Decomposition Scavenger Hunt Worksheet for each pair of students

Session 2

- › Place butcher paper or newspaper in one area of the garden, and weigh it down. This is where students will be able to gather around and sort their decomposed objects into a long spectrum.

FACTORS AFFECTING RATE OF DECOMPOSITION

Environmental

- Weather
- Temperature
- Moisture content in the soil
- Presence of decomposers

Characteristics of the Object

- Size of object
- Water content
- Whole vs. broken objects
- Surface area

ACTION STEPS

Session 1:

1. Engage: Gather students in a circle, and show them your decaying item from the garden. Ask, *Do you know what this used to be? What has happened to it? How long ago do you think it was living?* Explain, *Today we’re going to be*

setting up decomposition observations in the garden, but first we’ll be going on a scavenger hunt throughout the garden to find elements and evidence of decomposition. (3 min.)

2. Scavenger Hunt: Briefly review expectations and the strategy you’ll use to gather them back together. Put students into pairs, then pass out clipboards with pencils and the Decomposition Scavenger Hunt Worksheet. Explain how to engage in the Scavenger Hunt by trying to find the objects. Help individual students stay focused during the hunt by asking open-ended questions such as, *Where do you think you might find . . . ? (10 min.)*

3. Explain: Gather students back together, have them share a couple of their findings. Explain, *We can use a lot of different words to describe when something is decomposing. Rotting, decaying, and decomposing all mean when an organic substance, something that was once alive, breaks down to its basic parts. This process can release all the nutrients it held back to the earth. Ask, What do you think affects how quickly something breaks down or decomposes?* Discuss environmental factors such as weather, temperature, moisture in the soil, and the presence of decomposers, in addition to characteristics of the object itself, including size, water content, and how much surface area is exposed. *We’re each going to find an object in the garden that we’re curious to see decompose. We’ll bury our object, mark our spot, and then two weeks from now, dig it back up to see how it has decomposed. (5 min.)*

4. Burying Objects: Show students your sample location marker. Pass out materials so they can make one themselves. Be sure to outline

parameters for what objects they can use and where they can bury them. For example, you'll want to remind students that their object must've been alive at one point, and you may want to say that there has to be at least ten more of their object still on the plant or in the space. Then point out the beds or places they're allowed to dig. Finally, before you set students free to find their objects, demonstrate how to safely use trowels. **(12 min.)**

5. Making Predictions: Have students fill out the Observing Decomposition Worksheet, applying the information they considered during your discussion of factors to make a prediction of how much their object will have decomposed by your next session. Collect the worksheets for safekeeping until your next meeting. **(10 min.)**

Session II:

6. Review Worksheet: Pass back students' Observing Decomposition Worksheets, and have them refresh their memories of their predictions. Ask, *Based on the weather we've had and how long it's been since we buried our objects, would anyone change their predictions?* Discuss and then pass out trowels for students to dig up their object. **(5 min.)**

7. Unearthing Objects: Remind students that they are scientists, and they'll be comparing their predictions to their direct observations, just like scientists do. Then have each student find their buried object and observe the changes, drawing and recording their observations on their worksheet. **(10 min.)**

8. Making a Spectrum of Decomposition: Explain, *Now you'll compare your objects to other classmates'. Once you're in your groups,*

you'll create a spectrum of your objects, from least decomposed to most, or quickest rate of decomposition to slowest. Be prepared to explain to the class what patterns you observe in your groups. Divide students into groups of six to eight. Have them line up their objects in a spectrum. Circulate, asking students to explain the rationale of their order. **(10 min.)**

9. Whole Group Drawing Conclusions: Have each group share their findings with the whole class. Ask, *What patterns did we notice? What factors seem to most affect how quickly something decomposes?* **(5 min.)**

REFLECTION

Have students discuss the following questions in small groups, then share with the class: **(5 min.)**

Social and emotional learning

- *What was challenging about this activity? How did you work through it?*
- *What would you do differently in the future?*
- *Ask yourself: Was I safe and respectful in the garden today?*

Check for understanding

- *What factors affect decomposition?*
- *Was your prediction supported by what you observed?*
- *If you were to do this experiment again, how would you set up the test differently?*

ADAPTATIONS

Mini-Experiment: Two weeks or so prior to this class, bury a few different objects in the ground, such as a tomato, a carrot, and a pencil. Take a photo before covering them with soil. Then, to start this lesson, show students the photo, and dig up the objects. Use this "aha!"

moment to engage students with the concept of decomposition before they set up their own decomposition experiments.

Planting with Compost Variation: If you have finished compost in your garden, plant an appropriate crop in a bed where you add compost to only half the bed. Have students periodically check the bed to observe differences between germination, growth rate, and health.

Indoor Worm Bin Variation: If you have a worm bin, you can set up experiments to see which food scraps the worms prefer or to observe the rate of decomposition when you have a whole fruit versus a fruit that has been cut into small pieces to increase surface area.

Music: Sing “The FBI (Fungus, Bacteria, and Invertebrates)” by the Banana Slug String Band with your students.

ACADEMIC CONNECTIONS

Next Generation Science Standards, Life Science Disciplinary Core Idea

NGSS LS2.A

Interdependent Relationships in Ecosystems

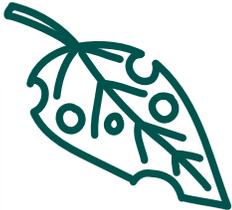
The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able

to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

DIRECTIONS: Look for the objects listed below that are part of the decomposition process. When you find one, check the box!

CAN YOU FIND...?

DECOMPOSITION CLUES:

<p>A leaf that's been chewed on</p> <input type="checkbox"/> 	<p>A piece of rotting wood</p> <input type="checkbox"/> 	<p>Dried, brown leaves</p> <input type="checkbox"/> 
<p>A dead flower</p> <input type="checkbox"/> 	<p>A rotting fruit</p> <input type="checkbox"/> 	<p>Worm castings (hint: they look like tiny round balls of soil)</p> <input type="checkbox"/> 

DECOMPOSERS:

<p>Fungus</p> <input type="checkbox"/> 	<p>An invertebrate, such as a worm, mite, or roly poly</p> <input type="checkbox"/> 	<p>Another decomposer?</p> <hr/> <input type="checkbox"/> ?
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HUMANS HELPING DECOMPOSERS:

<p>A compost pile in the garden</p> <input type="checkbox"/> 	<p>What's the freshest item you found in the compost pile?</p> <hr/> <input type="checkbox"/> ?	<p>What's the oldest item you found in the compost pile?</p> <hr/> <input type="checkbox"/> ?
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Name: _____ Date: _____

Observing Decomposition

Directions: Fill in the following chart.

Day 1

Object: _____

Date: _____

Draw a detailed picture of your object on the day you bury it:

Factors Affecting Decomposition

Environment:

What's the weather like today?

Sunny Cloudy Rainy Other _____

What was the soil like where you buried your object?

Rocky Clay-Like Hard Sandy Moist

Other _____

Did you see any decomposers?

Yes No

What did you see? _____

Quality of your Object:

How big is your object? (estimate in centimeters or inches)

How soft or hard is your object? Describe its texture.

Has your object already started breaking down? How do you know?

What do you predict your object will look like two weeks from now?

Day 2

Object: _____

Date: _____

Draw a detailed picture of your object on the day you dig it up:

How has your object changed in size, weight, texture, smell, and color? How does this compare to your prediction?

Is your object smaller than it was? Where do you think the missing matter or "stuff" has gone?
