



## At Home Science Down in the Dirt

This science experiment can be done using simple household items. Create your own micro-compost to observe decomposition and examine the importance of healthy ecosystems.

### What You'll Need:

- Large empty plastic bottle (ex: 2L soda bottle, milk jug, empty water gallon)
- Water
- Food Scraps (things like banana peels, apple cores, orange peels, egg shells, bread crust, coffee grounds, tea leaves. NOTE: no dairy, meat, or oils)
- Empty toilet paper rolls
- Dirt (optional)
- Scissors or knife
- Safety pin, thumbnail, or ballpoint pen
- Tray or newspaper
- Small dish towel

### How to Start:

Did you know you can *recycle food* to make soil for new plants? It's called composting! This activity will help you make delicious nutritious soil for the beans you planted last week.

#### Making a Mini Compost Bin

1. Collect your items.



2. Wash and rinse your container so it is clear of any leftover beverage and remove the labels
3. Have an adult cut off the top section of the bottle.



4. Use a safety pin to poke holes in the bottom of the bottle for drainage.



Compost is a special mixture of **green** and **brown** organic matter. Green organic matter are fresh things like grass, and food scraps and contains a lot of nitrogen. Brown organic matter are things that aren't living but used to be a plant like toilet paper rolls, and dead leaves and contains a lot of carbon.

5. Fill the bottom of the bottle with your **BROWN** organic matter. We used newspaper scraps, dead leaves, and a scoop of dirt. Dampen with water (careful not to add too much)



6. Add your **GREEN** organic matter on top of the brown.



7. Place the top of the lid upside down in the container and water one more time.



8. Place your container in a sunny spot (indoors or outdoors) and cover with a dish towel.



9. Once a day stir and water your compost to help the decomposition!

Compost and soil have tiny microorganisms that break down the organic matter and turn it into soil! Similar to worms, they are very beneficial in turning food waste into new soil. Stirring your compost helps feed the bacteria. Over time, you will have created your very own delicious plant soil that will be great to feed to your bean seed, or other garden plants!

## Diving Deeper:

### Microscopic Nutrients

Compost is so yummy to plants because it contains an abundance of nutrients and minerals: Nitrogen, Phosphorus, and Potassium that plants need to grow healthy. Our bodies also need a variety of nutrients to survive. Look in your fridge and pantry and list the foods you see that match the colors of a rainbow. Orange foods have a lot of Vitamin A which helps our eyes. Red foods are good for your heart and contain lots of Vitamin A and C. Green foods help build your muscles! They contain lots of iron. Yellow foods contain potassium, which helps the cells in your body do their jobs. Blue and purple foods are high in antioxidants which help you stay hydrated. Try to eat a rainbow of foods to help make your body strong! (and remember to throw your scraps into your compost)

### Break it Down

Test how long different materials take to decompose. Find a spot in your yard to dig a deep hole, about 1 foot down. Put different items in the hole like food scraps (potato peel, orange peel, apple core, etc), paper towel tube, and something plastic like a bottle cap. Cover your hole and mark the spot so you can find it again easily. Check back after 3-4 weeks and see what's happened to the buried objects! Which took longer to decompose?

### Soil Composition

Test the composition of your soil. Fill an empty water bottle, jar, or other clear container halfway with soil. Add water until full and let the soil absorb the water for about 5 minutes. Then shake the bottle vigorously for about 3 minutes. Set the jar down and let the dirt settle. After an hour or so, you may see layers emerge in your soil. At the bottom layer will be the sand, the middle layer is silt, the top layer is clay. Which layer is the largest? The smallest? What do you think this means about your soil? If you have a ruler or measuring tape, measure each layer and compare.

**For a math challenge:** Find the percentage of sand, silt, and clay in your soil by using fractions. Measure the entire soil layer top to bottom, this number will be your denominator (goes on bottom of the fraction). Next, measure each layer with a ruler or measuring tape, these numbers will be your numerators (goes on top of the fraction). Divide your numerator by your denominator to get a decimal. Move the decimal to the right two places, this is your percentage. All your percentages added together should be 100.

### The pH Test- Chemical Reactions

The pH scale measures how acidic or basic a substance is. It's a numbered scale from 1-14 where a pH of 1-6 is acidic, 7 is neutral, and 8-14 is basic. Things like lemons are acidic! Things like soap are basic! Some seeds grow best in soil that is acidic, like radishes; and some prefer more neutral soil like kale. Test the pH of your soil at home. Collect a dirt sample from different places in your yard, or in a safe space in your neighborhood. Make sure an adult helps you. Add two spoonfuls of soil to two different cups. In one cup, add  $\frac{1}{2}$  cup of vinegar. If the dirt fizzes, it is basic. If nothing happens after adding vinegar, add water to the other cup of dirt to make mud then add  $\frac{1}{2}$  cup baking soda. If it fizzes, it is acidic with pH between. If nothing happens when you add the baking soda, you have neutral soil! You can repeat with soil from a different area to compare.

## **Additional Resources**

[Make the Most of Compost!](#)

[The Dirt on Decomposers](#)

[Break it Down- PBS Kids](#)

[Layers of Soil](#)

[Soil Composition](#)

[Compost Stew Read Along](#)

## **Standards Covered**

SKE2. Obtain, evaluate, and communicate information to describe the physical attributes of earth materials (soil, rocks, water, and air).

c. Use tools to observe and record physical attributes of soil such as texture and color.

S3E1. Obtain, evaluate, and communicate information about the physical attributes of rocks and soils.

b. Plan and carry out investigations to describe properties (color, texture, capacity to retain water, and ability to support growth of plants) of soils and soil types (sand, clay, loam).

S4L1. Obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an ecosystem.

c. Design a scenario to demonstrate the effect of a change on an ecosystem. (Clarification statement: Include living and nonliving factors in the scenario.)

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change.

c. Plan and carry out an investigation to determine if a chemical change occurred based S5L4. Obtain, evaluate, and communicate information about how microorganisms benefit or harm larger organisms on observable evidence (color, gas, temperature change, odor, new substance produced).

a. Construct an argument using scientific evidence to support a claim that some microorganisms are beneficial.

S6E5. Obtain, evaluate, and communicate information to show how Earth's surface is formed.

h. Plan and carry out an investigation to provide evidence that soil is composed of layers of weathered rocks and decomposed organic material.

S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.

c. Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.

d. Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical. (Clarification statement: Evidence could include ability to separate mixtures, development of a gas, formation of a precipitate, change in energy, color, and/or form.)

SB5. Obtain, evaluate, and communicate information to assess the interdependence of all organisms on one another and their environment.

e. Construct explanations that predict an organism's ability to survive within changing environmental limits (e.g., temperature, pH, drought, fire).

SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.

c. Analyze and interpret data to construct an argument of the necessity of biogeochemical cycles (hydrologic, nitrogen, phosphorus, oxygen, and carbon) to support a sustainable ecosystem.

MGSE4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.