



Soil Your Undies Experiment

Connected Next Generation Science Standards

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Featured Science and Engineering Practices

Planning and Carrying Out Investigations

Featured Cross-Cutting Concepts

Structure and Function

Materials

- Teacher - small whiteboard, chalkboard, or poster-board
- Garden notebooks or Soil your Undies worksheets and clipboards
- Pencils
- Ruler
- Hand trowels or shovels
- 2 garden signs or labels
- 2 pairs of white, 100% cotton underwear

Overview

Soil is important to a plant's health because it provides plants with both water and nutrients that are necessary for healthy growth. The Soil Your Undies Challenge was popularized by American farmers to help promote the importance of healthy soil, but it's also a great activity to use with children in the garden to learn about soil microbe health. If students did the FBI Lesson, this is a great way to observe evidence of tiny fungus, bacteria, and invertebrates that are hard to see.

Students will

- Conduct an investigation to assess school garden soil quality.
- Understand the importance of soil microbes.
- Observe the amount of decomposition and soil microbe activity in two different locations.

Teacher Preparation

- Purchase 2 pairs of non-dyed, 100% cotton underwear.
- You will need to wait 2 months to allow the microbes to do their work. Plan to do the first part of this lesson at least 2 months before the end of the school year.

Guiding Question - How can we tell if the garden soil is healthy and good for growing plants?



Soil Your Undies Experiment

Settings

- School garden or green space
- Can be taught at any time of year the ground is not frozen.

Microorganisms are too small to be seen by the naked eye and include forms of bacteria, fungi, algae, and more.

Explore

- As you walk out to the garden, have students discuss with a partner why they think soil is important for plants.
- If you have already done the Soil Recipe lesson, review the soil ingredients - water, air, rocks, and decomposing matter.
- Explain to students that there is a fifth part of the soil - **decomposers**. Healthy soil is alive! **Dirt**, the stuff they track into the school, is dead soil with no living organisms.
- Create a definition of microorganisms with students. Guide students to come to understand that **microorganisms** are tiny organisms that we cannot see without using a microscope.
- Today, they are going to set up a 2 month long experiment, so they can see evidence of those tiny soil microorganisms. The more microorganisms the soil has, the healthier it is.
- With students, choose 2 different spots in the garden to test the soil. Consider locations like garden beds, a grassy lawn, a native plant garden, or somewhere in the schoolyard that has few plants. Make sure it is a location that will not be disturbed in the next 2 months.
- Hand out trowels or shovels. Students then dig a hole as wide as the underwear at each site. The whole should be 6-8 inches deep since most organic activity takes place in the top soil layer.
- Allow students a few minutes to observe the soil and soil organisms. Does the soil look healthy? Do you think it is a good home for microorganisms?
- After digging the hole, spread the underwear out in the hole and cover well with soil. Mark and label the site clearly with a name, like "Location 1" and "Location 2", for easy retrieval 2 months later!



Soil Your Undies Experiment

Digging Deeper

- After burying the underwear, give students a few minutes to write or draw what they think will happen to the buried underwear. Will the underwear look the same at each location? How might the microorganisms affect the underwear? Gather a few student responses.
- All of the underwear, except the elastic waistband, is made from cotton, a plant. How might the cotton part change compared to the synthetic waistband? Or ask which part of the underwear they think the worms and microorganisms will eat? Give students a few minutes to change their prediction after the class discussion.
- Which environment do they think will attract more microorganisms? Take a class vote of which location will have the healthiest soil and record the responses.
- Mark a date at least 2 months away to dig up the underwear experiment.

Making Connections

- After two months, remind students of their underwear predictions.
- Return to each experiment location with the same journals or worksheet. Students carefully dig up the underwear with hand trowels or shovels.
- One student picks up the underwear and gently shakes the dirt off it. The underwear might be fragile or in pieces. Place it somewhere students can examine the underwear for holes and microorganism evidence.
- Repeat this process at Location 2.



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You can improve soil health by feeding the microorganisms! Add compost, grow a cover crop, or cover bare soil with mulch.

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- Allow students a few minutes to write or draw their underwear observations.
- Have students turn to a neighbor and compare how their predictions and results differed.
- Bring the class back together. Which location do they think has the highest microorganism activity and has the healthiest soil?
- Either as a writing or discussion prompt, Why do you think the microorganisms were different at the 2 locations?
- If there was a low level of activity and few holes in underwear at one site, brainstorm or research what you could do to improve the soil health and attract more microorganisms. Implement their suggestions if possible.