

Space Travelers

Key Topics: Soil Composition, Soil Formation, Topsoil, Weathering, Decomposition, Organic Matter, Soil microorganisms

Grade Levels: K, 2

Outside

Lesson Overview:

In this lesson students work in small groups as space travelers trying to decipher the composition of soil. After dissecting soil to identify ingredients, they will attempt to manufacture soil. Students will then learn about the important role weathering and decomposers plays in soil formation and will understand how people and healthy soil are codependent.

Suggested Time Allowance:

Option 1 - Dissecting Soil: 30 minutes

Option 2 - Manufacturing Soil and Wrap Up: 30 minutes

Suggested Activities and Learning Objectives by Grade

Level:

- K:
 - K-ESS3-3 Why is soil important?
 - K-2-ETS1-3 What are two ways we can make soil?
- 2:
 - 2-PS1-1 What is soil made of?
 - 2-ESS1-1 How fast does soil formation occur naturally?



Essential Question(s) that Connect CCCs and SEPs:

- What ingredients make up soil? How is soil created? (*Cause and Effect*; *Asking Questions and Defining Problems*).
- How can we investigate what soil is made of if you collect just one small scoop. What tools will we need? (*Scale*; *Planning and Carrying out Investigations*)
- Can we use our scientific skills to study what leads to the ingredients you identified (rocks, sticks, sand, etc) changing into soil or remaining the same? Can you create soil with the ingredients you identified? (*Stability and Change*; *Planning and Carrying out Investigations*)
- What explains how rocks, branches, leaves, sand, and other natural materials develop into the soil? (decomposers and weathering!) What would our soil be like without decomposers? How does healthy soil affect people? How can people help to maintain and create healthy soil? (*Cause and Effect*; *Construct Explanations and Design Solutions*)

Materials:

- 2 trowels per teams of 3-4
- 1 hand lens per team

- Tweezers
- Newspaper
- Clipboard, paper, and pencils for each team

EG Team Support Needed:

- None

Prep:

This activity is designed to take place 100% outside! Students will be dissecting and “manufacturing” soil, so it would get messy in an indoor environment. However, if rain is in the forecast you can bring this activity inside with ample newspaper, cups of soil for each group to dissect, and a variety of materials that you predict they will want to “manufacture” soil with (rocks, twigs, wood chips, leaves, plants, grass, etc.)

- Set materials up in your outdoor classroom.

Activity Procedure:

Engage:

Gather students in the seating area of your garden. Ask students to close their eyes. Read the following in your most alien voice:

“Imagine that we are scientists from the planet Zog, journeying to planet Earth on the starship Zogma. We have been chosen to make an important journey. The people of Zog are growing tired of raiding other planets for food, and we want to find out how to grow our own food. Our astronomers have detected a faraway planet called Earth, which appears to be covered in green plants. Our computers have analyzed the reason for this and it appears to be a combination of sun, water, air, and a brownish-gray substance called “soil”. On Zog we have plenty of sun, water, and air, but no soil covering the rocky ground. It is difficult for us to believe that all their food comes from this simple substance. Our mission as scientists is to find this material called “soil”, dissect it, and record each and every ingredient for our computer. This will allow us to learn the secret of this material so we can make soil back on planet Zog. Upon landing we will break into small groups to gather and dissect the soils on planet Earth. Each team will use the specially designed tools that our engineers have created just for this purpose. Remember: It is crucial to the success of our mission that each and every substance found in the soil be recorded. Good luck to all of you. Long live planet Zog! All right, you can open your eyes, and it looks like we have landed on planet Earth!”

Explore:

Action:

Introduce students to the callback you will be using for this activity (silent coyote, give me 5, etc.) and stick with it! **How can we investigate what soil is made of if you collect just one small scoop. What tools will we need?** (Scale; Planning and Carrying out Investigations). Divide students into groups of three to four and give each team a hand trowel, some newspaper, and a hand lens. Have them explore soil in different areas of the garden and schoolyard by digging up a trowel-full and placing it on the newspaper. Have students in each group dissect the soil, identifying each substance found. Have one student in each group record the soil ingredients.

Explain:

Upon completion of the task, ask teams to compare and contrast the soils they investigated. Ask them to report for the class the ingredients of their soil. Have the groups discuss the ingredients they found: crushed rocks, crumpled leaves, twigs, bugs, sand, and so on. Many groups will list among their ingredients “dirt” or “brown stuff”. Challenge them to figure out what the brown stuff is. The simplest answer: It’s just smaller pieces of all the other ingredients.

Elaborate:

Action:

Assign some of the listed ingredients to each team and ask them to return with a small quantity of each ingredient.



Can we use our scientific skills to study what leads to the ingredients you identified (rocks, sticks, sand, etc) changing into soil or remaining the same? Can you create soil with the ingredients you identified? (Stability and Change; Planning and Carrying out Investigations). Challenge teams to use the raw ingredients to manufacture soil by scraping rocks together, breaking twigs apart, and so on. When the frustration level of the students is reached, ask them whether or not soil can be made by hand. Why not? What explains how rocks, branches, leaves, sand, and other natural materials develop into to the soil? (Cause and Effect; Construct Explanations and Design Solutions). Explain that each inch (2.5 cm) of topsoil requires more than 100 year to form, by the processes of weathering and decomposition. Our hands and tools cannot equal the power of weathering and decomposers! Also, soil is alive, with more than 100 billion microorganisms living in a pound (0.45 kg) of soil, in addition to the roots, insects, worms, and other living things we can see in the soil. There is no recipe that could duplicate this substance so full of life and so necessary for life!

Evaluation:

Ask students to raise their hands to share:



Will the super computer on planet Zog be able to manufacture soil? How is soil important to Earthling’s lives? Could Earthlings make more soil if we lose what we have to erosion or pollution? How can Earthling’s help to maintain and create healthy soil? Is soil alive? How? Do all materials in soil decompose at the same rate? (weathering of rocks takes much longer than decomposers breaking down plant material.) What do earthworms and other decomposers do for the soil? (Cause and Effect; Construct Explanations and Design Solutions)

Also, refer back to the Learning Objectives for your grade level and ensure that they have been met by asking the given learning objective question.

Extension Activities:

- If there is time, head out into the garden together to look for worms and other invertebrates; fungus; partially decomposed plant material; and any other evidence of decomposers making soil.

- Create a classroom worm bin out of a simple rubbermaid container to observe decomposers creating soil. Follow this lesson plan for guidance: [The Great Worm Tillers](#)

Tips and Caveats:

- Emphasize the importance of students listening for and responding to your call back prior to setting them free! There is not much buffer time in this activity.
- Refer to “Is Soil Alive” lesson plan for a more academically rigorous lesson for upper grade levels.

Cited Curriculum:

LifeLab - The Growing Classroom: [Space Travelers](#)