



Space Travelers

DESCRIPTION

Students work in small groups as space travelers trying to decipher the composition of soil.

OBJECTIVE

To explore the composition of various soils.

TEACHER BACKGROUND

Soil is something all of us take for granted. However, it is one of the necessary life-sustaining ingredients of our planet. And soil is exciting! It varies dramatically within a small area. When students explore the surface soil (topsoil) they will discover many living things, including roots, earthworms, and insects. In addition, the topsoil contains humus (the high-nutrient component of the soil that is formed by decayed organic matter) and rock particles. As students dig deeper, the soil composition changes.

Soil formation is a very slow process. Each inch (2.5 cm) of topsoil requires more than 100 years to form, by the processes of weathering and decomposition. Weathering, caused by rain, wind, freezing and thawing, glaciers, and plants, breaks down rocks into tiny particles — the inorganic part of the soil. Bacteria, fungi, and other living things slowly decompose nutrients, such as leaves and twigs, recycling them into humus — the organic matter in soil. Soil is alive: More than 100 billion microorganisms live in a pound (0.45 kg) of soil.

MATERIALS

- * Two trowels per team of three
- * One hand lens per team
- * Tweezers
- * Newspaper *Yogurt container lid*
- * Science journals

CLASS DISCUSSION

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 Star Ship Zogma. We have been chosen to make an important journey. The people of Zog are growing tired of raiding other planets for food, and 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 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 groups of three scientists, with two soil dissectors and a recorder in each team. 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!

ACTION

1. Divide students into groups of three and give each team a trowel, some newspaper, and a hand lens. Have them explore soil in different areas of the garden and schoolyard by digging up a trowelful and placing it on the newspaper. Have two students in each group dissect the soil, identifying each substance found. Have the third student in each group record the soil ingredients in his or her journal.
2. 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.
3. Assign some of the listed ingredients to each team and ask them to return with a small quantity of each ingredient.
4. Upon their return, 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? Explain that each inch (2.5 cm) of topsoil requires more than 100 years 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!

WRAP UP

Will the super computer on planet Zog be able to manufacture soil? How is soil important to Earthlings' lives? Could Earthlings make more soil if we lose what we have to erosion or pollution? Is soil alive? How? Do all materials in soil decompose at the same rate? What do earthworms do for the soil?

