

TRB 4:3 - Investigation 5 - What is in Soil?

Summary

This activity will help students understand the basic components of soil and relate the components to plant growth.

Group Size

Small Groups

Materials

- Scale
- Garden soil
- Hand lens
- Plates
- Paper towel
- Tweezers
- Insect viewers (optional)
- Measuring cups
- Containers for soil (preferably clear)
- Spoon
- Worksheet: [What is Soil?](#) (pdf)

Additional Resources

Books:

Dirt by S. Tomecek (National Geographic)
University Extension and Utah Foundation for Agriculture in the Classroom, Secrets in the Soil. 435-797-1657 www.agclassroom.org/ut. This is an excellent resource. It includes a video and lesson plans that align with the core.

Videos:

Earth's Crust - Rocks and Soil Series in Bill Nye the Science Guy. M6535: Disney, 1995. In the rocks and soil section see how to make crystals, the three basic forms of rock and demonstrate how hot, molten magma could penetrate the Earth's layers through vents.

Background for Teachers

Soil is made up of particles of rocks and minerals, dead plant and animal matter, tiny living organisms, gases (air), and water. The particles of rocks and minerals found in soil have broken away from larger pieces of rocks and minerals. Some particles are large chunks of rock and others are tiny mineral particles, which get dissolved by water in the soil.

Soil contains space filled with water and gases (air). Water soaks in the ground from rain (and other forms of precipitation). Gases come from the air, plants, and animals. Water in the soil makes minerals available for plants to use.

Soil also contains organisms. Living organisms (such as bacteria, fungi, insects, etc.) are an important part of soil. Living organisms break down nonliving organic plants and animals in the soil, which makes soil rich and healthy for plants to grow in.

Every soil consists of minerals, organic matter, water, and air. The proportions may vary but the following list is the average composition of the major soil ingredients: 45 percent minerals, 25 percent water, 25 percent air, 5 percent organic matter (both living and dead).

Soil is important to plants. Soil holds plants in place and holds the water that plants need. Soil contains mineral nutrients that plants need in trace amounts to grow.

Soil is a critical resource. Most of our food crops are grown on soils that have taken millions of years to form. Food can be grown without soil, but we do not have enough hydroponic technology available to feed the world. It is important to prevent soil erosion to protect valuable soils.

Intended Learning Outcomes

2. Manifest Science Interests and Attitudes
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Pre-Assessment/Invitation to Learn

Ask students what they think soil is composed of. Generate a list containing mineral or rock particles, air, water, living and dead organisms. Ask students to make a pie chart showing how much of each they think soil contains. Ask them to save it and compare their answers at the end of the activity.

Instructional Procedures

Activity 1 - Looking for Organic and Inorganic Material

Give each student 1/4 cup of soil, plate, paper towel, lens, tweezers.

Instruct them to use the hand lens to examine their soil. They are to look for organic matter (living and dead plants, insect parts, living insects) and non-living material (rocks and minerals). Have them make separate piles. They could put living insects in an insect view for better viewing and to contain them.

Students should record what they find in their logs.

Activity 2 - Water in the soil

Have students place their soil on a paper towel. Fold it in half and gently press. Return the soil to the plate. Examine the towel. Ask them to describe the condition of the towel. They should observe that it is wet. Ask what ingredient was removed from the soil? (water)

Place one cup of damp soil in a container. Weigh it. Record weight in science log. Place soil in a sunny window. Weigh it after a few days. Record results and differences in weight. Discuss how much water was in the soil. How can they tell?

Activity 3 - Air in the soil

Give each group of students exactly one cup of loose soil. Have them pack it down as tightly as possible. What does the soil now measure? Ask them how they were able to pack it down?

What is now not in the soil? (air)

With a spoon, loosen the soil so the top is again at the 1-cup line.

Give the students another measuring cup of water. Have them pour it slowly into the soil until it starts collecting on the top. Observe the air bubbles rising up. Discuss why they see air bubbles. How much water is left in the measuring cup? How much water did you pour into the soil? How much air was in the soil before adding the water? How do you know? Where did the air go when you added the water? Why do we see lots of worms on the top of the soil after a big rainstorm? Answers to discussion questions should be recorded in science logs.

Discuss the soil pie. What percentage of soil is air? Have students convert the information from the pie graph to the bar graph.

Extensions

Math-

Measure volume using milliliters, liter cups, and pints. Measure weight using grams, kilograms, and pounds. (*Standard IV, Objective 2*)

Science-

Brainstorm other objects that come from soil. Create flow charts that lead back to soil. (*ILOs 2, 3*)

Authors

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