

A Recipe for Soil

Summary

Students make soil using local materials and compare plant growth in natural and student-made soil.

Time Frame

2 class periods of 45 minutes each

Group Size

Small Groups

Materials

For each group of 3-4 students:

- Denim soil-making bag
- Dead leaves and other plant material
- Pebbles
- Sand
- Water
- Hammer or mortar and pestle
- 2 small cups or flower pots
- Fast growing seeds (radish, grass, lettuce)
- Latex gloves or plastic sandwich bags for students to wear on hands

Background for Teachers

Soil is the material that constitutes the outermost layer covering practically all of the Earth's land surface. Soil is made of air, water, humus (decayed organic material) and rock particles. Soil is formed by the slow process of weathering (the breaking down of rock), erosion (the moving and deposition of weathered rock material), and the combining of those rock particles with air, water and organic material. It can take from 100 to 600 years or more for nature to make one inch of topsoil. Often one inch of topsoil is removed from land by erosion in one year. Soil can be "manufactured" by people imitating the forces of nature. When people use composted organic materials in their gardens, they are helping soil to develop.

This activity can also be done in the field or as a homework assignment.

Intended Learning Outcomes

- Conduct a simple investigation.
- Compare things and events.
- Know science information.
- Record data accurately.

Instructional Procedures

Review with the students the "recipe" for soil: 25% air, 25% water, 45% rock particles, 5% organic material.

Explain to the students that they are going to make soil by replicating natural processes. They will gather organic material, "weather and erode" rock material, and mix it with air and water to grow a plant.

Ask the students to gather
dead leaves

small twigs
flower petals
other small plant material
pebbles
sand

Much more pebbles and sand than organics are needed because soils contain more rock parts than they do organics.

Place all materials in a small bag made of denim or other heavy material (or use mortar and pestle to grind materials). Pound mixture with a hammer until the rocks are pulverized.

Remove from the bag, place in planting pot, and add water (the act of pouring the materials into the pot will add air to the mixture).

Repeat this process until you have enough soil to fill a small cup or flower pot 3/4 full.

Plant 10 seeds in their soil and 10 more seeds in a pot containing natural soil (not potting soil).

Then observe and compare the growth. This will take a week or more. Have the students note when the seeds begin coming up out of the ground. Have them measure the seedlings as they grow. They should also record how many of the ten seeds came up on each of the pots.

Relate the components of soil to the growth of plants in soil.

Water is necessary to carry nutrients into the roots and up the stem. It is also necessary for the plants to grow.

Air is necessary to allow the roots to "breathe". Also, air spaces in the soil allow a place for water to enter the soil.

Organic matter, plant and animal parts, help hold the water in the soil. They also provide nutrients.

Rocks and minerals provide nutrients to the plants and structural support to the roots.

Ask the students how they could provide mineral nutrients for plants to grow without soil. List their responses. Responses might include: grow plants in wet towels, grow plants in wet gravel, grow plants in water.

At the end of the week, help the students write a lab report. Their lab report should contain:

A clear statement of the question they were trying to answer. (In this case, it was something like, "Will plants grow better in the soil I made or in natural soil.)

A description of their materials and set up.

A record of the data they collected (when the plants came up, how many came up, how much they grew). The could be recorded in a table or in graph form.

A conclusion that states what they learned from the experiment. Did it answer the question they asked? If so, what was the answer?

Assessment Plan

Assess the student's lab write up using the rubric below.

Rubrics

[Science Lab Report Rubric](#)

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