



Soil Supreme

Lesson Description

Students investigate soil layers with three models: a jar of water and Earth materials, illustrations on paper, and edible materials.

Subjects

Art, Language Arts,
Science

Teacher Background

This lesson reveals a world that is usually hidden from view. It usually takes deep digging or a field trip to a road cut to discover Earth's three predominant soil layers. But through fun activities and a model of different soil types, students will learn how soil forms layers and about the world of living things in the soil.

Soils have different layers. The layers are based on soil color, texture, and structure, and on the amount of organic matter and gravel present in the soil. You can differentiate between the layers because of these variations. Differences in layers based on color are the easiest to identify. In areas where the soil has been disturbed—such as in agricultural areas, building sites, or places with severe erosion—there may be only one or two naturally occurring layers present.

The uppermost layer of soil is usually the most productive part. It is characteristically darker and looser than the lower layers. Fallen twigs and leaves, dead grass and insects, rotting tree trunks, and other decaying organic matter enrich the top part, giving living animals and plants the nutrients they need to survive.

Time

Prep: 30 minutes

Activities: 1 ½–2 hours
(not including Extensions)



Topic: soil layers
Go to: www.scilinks.org
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Student Objectives

Students will be able to:

- explain the differences between topsoil, subsoil, and parent material; and
- construct models of the three soil layers.

The middle layer of soil is often lighter, denser, and grittier than the top part. This middle layer is usually low in organic matter and frequently contains small stones and pebbles. The next part—a transition area between the soil layers and rock—contains disintegrating rock particles, but has relatively little organic life. The deepest layer is the *parent material*, or *bedrock*, from which much of the soil originally formed.

Cross sections and models will help students visualize the soil layers.

Materials

For the Class

- Plastic jar (at least 1 Liter) with lid—e.g., tennis ball container
- Silty, sandy, and clayey soil samples from Lessons 1 and 2 (or see page x)
- Sand
- Pebbles
- Twigs
- Grass clippings
- Dried leaves
- Biodegradable liquid dish soap
- Spoon
- Bucket
- Construction paper squares (approximately 10 x 10 centimeters)—black, gray, dark brown, medium brown, light brown, and orange
- Poster paper or bulletin board
- Tape, glue, or pushpins
- Cake pan (33 x 23 centimeters/13 x 9 inches)

Learning Cycle

Perception: 30 minutes



Ask the local Natural Resources Conservation Service office for a county soil survey, which should give you information to adapt color choices to soil colors of your area (see the resources list in Appendix B).

Fill a large plastic jar one-quarter full of soil, pebbles, twigs, and plant matter. Fill the jar three-quarters to the top with water and add a few drops of dish soap. If desired, create charts on which students can record their predictions and observations during the activity.

- 1 Make sure the jar lid is secure. Shake the jar vigorously and let stand.
- 2 Ask students what they observe and discuss what the resulting layers are made of. You may wish to have students draw a series of sketches, or complete prediction/observation charts that you created beforehand.



- 3 Pour off the water without disturbing the layers. Use a spoon to sample each layer to show students that the soil components separated based on size. The densest particles—sand and pebbles—sink to the bottom of the jar. Silt forms the middle layer, clay forms the top layer and dead leaves, sticks, and other organic matter float on top of the water.
- 4 Make “before” and “after” sketches of the jar on the board, and have students help you label the sketches.
- 5 Distribute Student Handout 3A. Explain that the drawing is a cross section, a side-view of what the soil looks like in the ground. Ask students to draw on the empty jar illustration the things that are found in the layers, then to label each layer on the line provided. You may wish to add vocabulary word choices to this handout so younger students can choose the appropriate words to label the illustration.
- 6 Clean up by emptying the jar into the bucket, than dispose of the waste material outside.

Exploration: 30 minutes

- 1 Divide students into three groups and name them: Topsoil, Subsoil, and Parent Material.
- 2 Guide students to conclude what color their group should be, based upon their discoveries about soil. (Answers: the top soil layer is usually black, dark brown, or gray. The middle layer is often medium brown or light brown. Parent material is usually light brown, tan, or white. However, soil colors depend on what part of the country you live in.)
- 3 Ask each student to pick a piece of colored construction paper based on his or her group. Have groups gather and draw on the construction

Materials Cont'd.

- Crushed vanilla wafers (340 grams/12 ounces)
- Soft chocolate ice cream or chocolate pudding (2.20 Liters/ 2 quarts)
- Crushed dark chocolate cookies (340 grams/12 ounces)
- Six gummy worms (optional)

For Each Student Group

- Crayons, colored pencils, or markers
- Clear plastic cup
- Crushed vanilla wafers (21.26 grams/0.75 ounces, or approximately 6 cookies)
- Soft chocolate ice cream or chocolate pudding (0.275 Liters/ 0.5 cups)
- Crushed dark chocolate cookies (21.26 grams/0.75 ounces, or approximately 6 cookies)
- Gummy worm (optional)
- Spoons
- Napkins
- Student Handouts 3A and 3B



paper organisms and objects found in their particular soil layers.

- 4 Guide groups in the use of pushpins or tape to arrange their colored squares in correct layers on the bulletin board or poster paper. Discuss the papers' resemblance to real soil layers.

Application: 15–30 minutes

Prep

Prepare one cake pan and clear plastic cups of “Soil Supreme.” In the pan and each cup, first put down a layer of crushed vanilla wafers—this represents the parent material. Then create a layer of chocolate ice cream or pudding, which represents the middle part of soil. Pour on crushed dark chocolate cookies for the top layer. Add gummy worms to the top layer if desired. Freeze for at least two hours before serving. (Recipe makes approximately 16 servings.)

- 1 Cut a piece of Soil Supreme and discuss the layers of this cross section with students. Help students understand that the cake is a model of the real world.
- 2 Hand out pieces of Soil Supreme and enjoy. (Remember to eat in a clean classroom rather than in a science laboratory, and be mindful of any food allergies.)
- 3 Clean eating areas.

Evaluation: 15–30 minutes

Students should be able to name and briefly describe the three main soil layers. Students can color and label each layer of soil on Student Handout 3B. You may wish to provide younger students with a list of vocabulary words to help them label layers. You might

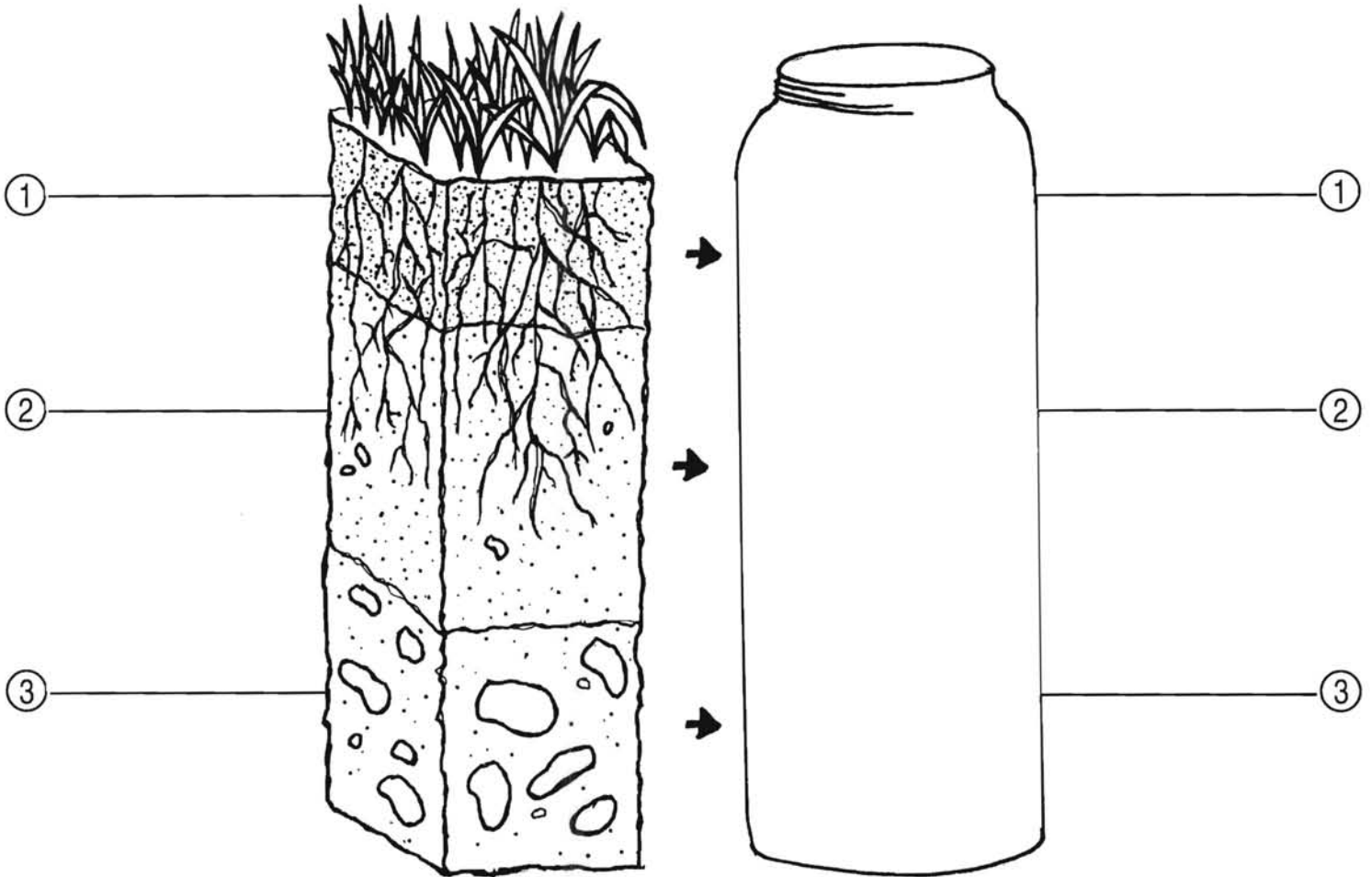


also ask students to draw things found within the soil layers.

Extensions: 30 minutes each

- To help students understand the complicated soil horizons, find a site where soil layers are exposed. Take the class on a field trip to a quarry, a site of extensive erosion, a streambank, or an excavation. Look at the soil and measure the depth of the horizons. To enhance students' observational skills, ask them to look for and record changes in soil color, rocks, wood fragments, roots, and other material in soil. Ask students why the layers are different or the same. (Answer: the characteristics of each layer are due to local geologic history, climate, biological activity, land use, and amount of time that the soil has been developing and eroding.) If a field trip is not possible, bring in photographs that show these soil horizon characteristics.
- Look for examples of cross sections in the school yard or in neighboring areas. Bring in pictures of cross sections, including a scientific illustration.
- Depending on the age of your students, prepare Soil Supreme in class and then eat it during the next class period. This will give your students a good introduction to measurements. Students can participate in crushing the cookies—put the cookies in sealed plastic sandwich bags and then have students crush the cookies with rolling pins. Letting your students measure the edible materials for Soil Supreme will give students a good introduction to measurements.

Name: _____



Name: _____

