Hands In Science

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Hands-in Science

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Students may not understand how rocks are formed or the nature of many geological processes, but most students are quite familiar with the dirt in their own backyards. In areas where there are not many large rocks to study, this is a good place to start when introducing several Earth science concepts, including local geology and the development of different types of geologic regions. Studying soil through a series of integrated activities is a great way to develop your own "hands-in" Earth science unit.

Identifying soil types

To start this activity, students locate their homes on an aerial soil survey map (available from the local agricultural extension office or the Soil Conservation Service). Students locate areas they are familiar with by focusing on roads and other surface features that are easily identified from above. Students also record the specific soil types found around their homes and bring in soil samples.

Next, students make a county soil map from the soils they collected (see Activity). Resource persons such as farmers, agricultural agents, or geologists can help students group the soils according to the characteristics used in identification. During this activity, students not only work with the actual soils of their area, but they also gain an understanding of what a soil's characteristics reveal about its origins. Soils are made up of a variety of rock particles, organic material, water, and air, so teaching about soils is one method of teaching about rocks and minerals.

Students develop a greater appreciation for soil by tracing the origins of food and other items directly or indirectly to soil. Everyday items such as blue jeans or candy bars can be traced back to the soil and provide an interesting eye-opener for students. For example, tracing the origin of blue jeans leads students through the department store, wholesaler, clothing factory, textile manufacturer, cotton farmers, fields of cotton, and finally to the soil itself. This illustrates the usefulness of soils for purposes other than growing food crops.

"Hands-in" activities

After making a county soil map and identifying soils, students can move to other lab activities.[1] In one activity, students measure the amount of moisture and organic matter in different soil samples and explain the differences to learn about percent composition and mass (see Activity). In another activity, students can practice their knowledge of volume by measuring the porosity of soil.

Assessment for this activity can include having students identify different types of soils. At the conclusion of the unit, place three to five samples of soils around the classroom. Have the students (or groups of students) determine whether the samples are sand, silt, clay, or a combination of soils (by determining particle size), and also have them determine porosity and fertility of the soil. If possible, have students try to determine where in their area the samples came from.

Other disciplines can also be included in this unit. Students could write reports about their projects or activities as part of their language arts class. Poems and short stories about soil, rocks, or soil organisms provide fun ways for students to express what they have learned. Soil bacteria, sterilization principles, microbes on a streak plate, and bacteria staining are just a few of the microbiology topics that can be covered. After combining these activities or others of your own, you should have an excellent Earth science unit that students can't wait to get their "hands-in." ❑

References

1. Eswaran, H., et al. 1990. The science of soil. *The Science Teacher* 57(5):50-53.

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Soil science

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Making a county soil map

Materials

- Soil
- Soil index
- Crayons or markers
- Paper
- Glue

Procedure

1. Allow the soils to dry before identifying them.
2. Group similar soil samples together based on their classification using criteria such as particle size, color, and porosity.
3. Draw or trace an outline of your county, labeling the general areas where you found each soil type.
4. Color waterways and surrounding areas and label other counties.
5. Spread a thin layer of glue on their county map.
6. On an area where a soil type is represented, sprinkle that soil on the paper until no more glue is visible. It is best to do all areas that represent a soil type at one time to prevent mixing and smearing the soils. The glue should dry for a few minutes before adding the next soil type.

Measuring moisture in soil

Materials

- Safety goggles
- Mass balance
- Pan
- Bunsen burner
- Soil

Procedure

1. Find the mass of a small amount of soil (A) and spread it out in a pan.
2. Heat it gently with a hot plate until steam stops rising.
3. Let it cool and weigh the soil again (B).
4. Determine the percentage of moisture in the sample using the following equation:

Percent of moisture =

$$\frac{(\text{Mass A} - \text{Mass B})}{\text{Mass A}} \times 100\%$$

Measuring the porosity of soil

Materials

- Soil
- Glass beaker
- Graduated cylinder

Procedure

1. Lightly pack 100 cm^3 of dry soil into a glass beaker.
2. Pour 100 mL of water into a graduated cylinder.
3. Pour the water gently from the cylinder into the beaker up to the soil level (the 100 mL mark).
4. Determine the amount of water added by subtracting the amount of water left in the graduated cylinder from 100mL.
5. Calculate the percentage porosity of the soil (volume water added) by using the equation:

Porosity =

$$\frac{\text{volume of water (mL)}}{\text{volume of soil (cm}^3\text{)}} \times 100\%$$

* 1 cm^3 = 1 mL for volume