

Follow-up Discussion

The most important part of this segment is to examine both the facts and beliefs generated by the class in their "Everything We Know About..." list. Research indicates that students will retain their previous misconceptions — in preference to the new information — until they actively recognize and correct their own errors. Because of this, it is important to lead students to the correct ideas while identifying and correcting any misconceptions from the class list. After reviewing the list, encourage students to share the answers they got to the questions raised, before viewing the program.

Raising a thought-provoking question is a good way to assess the overall depth of student understanding. A couple of suggestions are listed below:

- What are the characteristics of good soil?
- Do you think it is true that life could not exist on Earth without soil? Explain your thinking.
- How is soil in the desert different from soil in the forest?

Follow-up Activities

- Have students design an experiment in which they plant seeds in various types of soil (sand, sterilized potting soil, soil from the school grounds, rocky soil and clay soil) as well as in a moistened kitchen sponge. Have them compare plant growth patterns over time, being sure to control watering and sunlight.
- Have students make soil on their own. Ask them to create a 'recipe' for good soil and explain why they are combining the ingredients they have chosen (e.g. crushed rocks, dust, ashes, dead plants, earthworms, sand, etc.). Have them test their soil sample to see if it will support plant life and have them observe and compare plant growth in a number of different samples.
- Have students raise worms in a small worm pen in the classroom. (Materials are easily obtained through science supply houses.) Have children observe how long it takes for pieces of lettuce or other plant scraps to disappear after being added to the pen and explain what happened to them. Have them use magnifying lenses to compare the soil in the worm pen with other soil.

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- www.arnprior.com/kidsgarden/maint/soil.htm
This "Kidsgarden" Web site has valuable information on soil and gardening for kids presented in a clear and colorful format.
- tpwww.gsfc.nasa.gov/globe/index.htm
The "Soil Science Education Home Page" contains fun and informative material on the soil as well as learning activities appropriate for introducing elementary students to soil science.
- www.urbanext.uiuc.edu/gpe/tg/tg-case2.html
"The Great Plant Escape" teacher's guide is a great place to begin to explore how the composition of soil relates to its ability to support good plant growth and to recognize the many interrelationships between soil organisms and all the Earth's creatures.

Suggested Print Resources

- Laves, Bianca. *Compost Critters*. E.P. Dutton Children's Books, New York, NY; 1993.
- Oxlade, Chris. *Soil*. Heinemann Library Press, Barrington, IL; 2000.
- Schmid, Eleanor. *The Living Earth*. North South Books, New York, NY; 2000.

TEACHER'S GUIDE CONSULTANT

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All About Soil

Grades K-4

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

Before Viewing: Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, after reviewing the pre-viewing discussion questions provided for your class, create an "Everything We Know About..." list. Preview key vocabulary words and have students raise additional questions they hope will be answered by this program. Most importantly, students should be told that as "science detectives" they must listen closely, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

After Viewing: After a brief discussion about the program, challenge your "science detectives" to prove or disprove the accuracy of the facts they put on their "Everything We Know About..." list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



Program Summary

Without soil, there would be little life on Earth. Soil is the loose top layer of the Earth's surface in which plants can grow. It is made up of small pieces of rock, sand, clay and humus, which is decayed plant material. Soil also contains water, air and small organisms. Soil particles such as sand and clay are formed by the rubbing and tumbling together of large rocks, which break into smaller pieces. This occurs when rushing water or ocean waves pound rocks together. Moving water, wind and even ice can break down rock surfaces in a process called weathering. These same forces then carry the smaller pieces away to other places through a process called erosion. The large rocks from which the smaller rock fragments are formed are called the parent rock. Large fragments usually remain close to the parent rock, while lighter, smaller pieces can be deposited in other places far from the parent rock.

Soil takes a very long time to be created from the solid parent rock called bedrock. It usually forms in three layers. The surface layer of soil is called the topsoil. Topsoil has small particles of sand and clay, rich humus and small organisms, all of which make it a good place for plants to grow. The middle layer, called the subsoil, contains less humus and more clay, which acts as a barrier, trapping water as it drains through the soil. Large, heavy rock fragments form the bottom layer of the soil.

Soil is described by its properties, which include the shape and size of its particles, the amount of humus contained in it and, most importantly, how much air and water it can hold. Sandy soil permits water to drain right through it. Clay soil particles pack together tightly and do not allow water to drain through it easily. Loam is an equal mixture of sandy and clay particles with lots of humus mixed in. This is the best type of soil for growing food crops and many other plants.

Topsoil contains many living organisms, including worms, insects and millions of organisms so small they can't be seen without a microscope or magnifying glass. These organisms create humus by breaking down dead plants. Worms and burrowing animals like groundhogs loosen the soil, allowing it to hold more air and water. The droppings of creatures enrich or fertilize the soil. Some schools recycle leftover remains from lunches and create a rich soil through composting. By mixing the compost with the worm castings — soil from the worm pen — students create perfect soil for a vegetable garden.

The amount of rain and temperature in an area are very important factors in making soil. Hot desert areas get little rain and have very poor soil. Tropical rainforests get a lot of rainfall, but they have poor soil because the rain washes away the nutrients in the topsoil. Because people are becoming increasingly concerned about this important natural resource called soil, they are learning ways to care for it. Farmers fertilize soil, keep cattle from over-grazing in fields and rotate their crops, planting different crops in a given field each year.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the show.

soil — The loose top layer of the Earth's surface, made up of small pieces of rock (sand and clay), bits of dead plant material (humus), water, air and living organisms.

sand — Large round soil particles that do not fit together tightly and allow water to flow through them.

clay — Small soil particles that fit together tightly and do not allow water to flow through them.

humus — Decayed bits of plant material that make the soil better for plant growth.

erosion — The movement of rocks and soil from one place to another due to forces like flowing water, wind and moving ice.

parent rock — The large rocks from which soil is made.

topsoil — The upper layer of soil in which plants grow. The best topsoil is made of tiny sand particles, clay, humus, air, water and living creatures.

subsoil — The second layer of soil, containing less humus than the topsoil and usually more clay particles that trap and hold water.

bottom layer — The third layer of soil, containing mostly large pieces of broken rock.

bedrock — The solid rock layer below the three soil layers. Frequently, but not always, bedrock is the parent rock of the soil above.

soil properties — The different characteristics of soil such as the shape and size of its pieces, the kind of parent rock it came from, the amount of humus it contains and the amount of water and air it can hold.

sandy soil — Soil made mostly of sand particles. Sandy soil does not hold together well and allows water and air to pass through it easily.

clay soil — Soil made of tiny clay particles. Clay particles pack together tightly and act as a barrier to water, trapping it.

loam — Soil made up of a nearly equal mixture of sand and clay. If loam is mixed with humus, it makes a perfect soil to grow many plants in.

fertilizer — Materials that are added to the soil to help plants grow.

compost — A mixture of decayed plant materials used to fertilize the soil.

worm castings — The soil from a worm pen, containing the enriched soil that has passed through the worms' bodies.

climate — The usual weather found in a given area. Climate is the most important factor in the formation of soil.

crop rotation — Growing different types of crops in a field each year so the soil is not robbed of all its nutrients.

Pre-viewing Discussion

Before students generate their list of "Everything We Know About..." this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What is soil? Why is it important?
- How is soil made? How long does it take for soil to form?
- What kinds of animals need soil to live?

After the class has completed their "Everything We Know About..." list, and before watching the show, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

You may wish to ask your class the following questions to assess their comprehension of key points presented in the program.

1. What is soil? Why is it important?
2. Explain how soil starts out as huge rocks.
3. What is erosion and what does it have to do with soil?
4. How does a fast-flowing stream help create soil particles?
5. How can you demonstrate how rocks form soil with a container of rocks and some water?
6. What is humus? How is humus formed?
7. Why is humus good for the soil?
8. What is parent rock? How is parent rock involved in soil formation?
9. What are the different layers of soil? How are they different?
10. What does the top layer of soil usually contain? What is this layer called?
11. What is subsoil and why is it important to plants?
12. What is the bottom layer of soil like?
13. What is bedrock?
14. Why are large rock pieces usually found in the lower soil layers?
15. If you put some rocks into a container of flour and shook it, what would happen to the rocks? Why?
16. What are some common ways to describe soil? What are the two most important properties of soil?
17. What is the best kind of soil for most plants: sandy soil, clay soil or loam?
18. Why are prairie dogs and groundhogs good for soil?
19. How do earthworms help the soil?
20. What is composting?
21. How does the weather affect the soil in an area?
22. How do people harm soil and how can they help the soil?