

Soils

Narrative Summary

In this unit, students investigate the chief components of soil—sand, clay, and humus—and explore the relationship between soil and plant growth. Early in the unit, they create their own compost bags. This activity enables them to observe the decomposition of different types of organic materials over time. Students observe and read about earthworms to learn about their connection to plant roots and soil. The students also conduct tests that enable them to observe and compare such properties of soil as odor, appearance, and texture. Phenomena such as settling, water content, and soil consistency are also explored. These observations are then related to plant growth, as students plant cucumber seeds in a clear plastic tube. By observing root growth, students learn about the role of roots in keeping the plant anchored and upright. In a final activity, students apply what they have learned to investigate a sample of local garden soil.

Science Content

Soils are a complex mix of many materials and different-sized particles. Students investigate the physical properties of three major soil components and then extend their investigations to observations of plant growth in various soil mixtures. In order to investigate organisms and their environments, students observe plants and animals—including redworms—within soil samples. Students keep records and synthesize information from multiple



investigations. Using simple tools, students record heights of plants. They then pool their data and draw conclusions about what their local soil contains and its effect on plant growth. Reading selections extend the content of the unit and address such concepts as how people of various cultures use earth materials to build homes and other structures.

Assessment

Prior knowledge about soils is assessed through a brainstorming activity in Lesson 1 and revisited throughout the unit and during a post-unit assessment. Through a series of investigative activities, students learn about the components of soils. Their results and data records can be evaluated or observed to determine growth in skills, attitudes, and concepts addressed in the unit. Two embedded assessments challenge students to apply soil tests used throughout the unit to new soil samples. In Lesson 8, students use soil tests to analyze an unfamiliar mixture of soil components. In Lessons 14 and 15, students apply these same tests to a local soil sample. Suggestions for additional assessments include guidelines for conducting student conferences, evaluating student work products, and encouraging students to share what they have learned with visitors.

Goals for Soils

In this unit, students investigate the properties of three soil components—sand, clay, and humus—as well as their own local soil. They also explore the relationship between soil, roots, and plants. From their experiences, they are introduced to the following concepts, skills, and attitudes.

Concepts

- Soil contains particles of different sizes.
- Soil may contain animals, plants, and their remains.
- Over time, dead plants become part of soil.
- Composting—especially with worms—is an effective way to recycle old plants and other discarded organic matter.
- Sand, clay, and humus are three of the basic components in soil.
- Every soil component has unique properties that can be identified using simple tests.
- Different soils absorb water at different rates.
- Many factors, including soil, affect plant and root growth.

Skills

- Performing simple tests to describe and identify soil components.
- Observing, recording, and organizing test results.
- Interpreting test results to draw conclusions about soil composition.
- Reflecting on test results to predict how plants will grow in different soils.
- Assembling laboratory materials for soil experiments.
- Communicating results and ideas through writing, drawing, and discussion.
- Applying previously learned concepts and skills to analyze unfamiliar soil samples.

Attitudes

- Developing enthusiasm for investigating soil.
- Appreciating the importance of soil for plant growth and animal life.
- Accepting that a range of outcomes is valid.
- Valuing the importance of recycling.



Soils

Fundamental Concepts and Principles Addressed (K–4)

Science as Inquiry

Abilities necessary to do scientific inquiry

- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Ask a question about objects, organisms, and events in the environment.
- Communicate investigations and explanations.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations, depending on the questions they are trying to answer.
- Simple instruments, such as magnifiers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).
- Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.
- Scientists review and ask questions about the results of other scientists' work.

Physical Science

Properties of objects and materials

- Objects have many observable properties, including size, weight, shape, color, and the ability to react with other substances.
- Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.

Life Science

The characteristics of organisms

- Organisms have basic needs.
- Each plant or animal has different structures that serve different functions.

Organisms and their environments

- An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment.
- All organisms can cause change in the environment in which they live. Some of these changes are beneficial. Others are detrimental.

Earth and Space Science

Properties of earth materials

- Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties which make them useful in different ways, for example, as resources for growing plants.
- Soils have properties of color and texture, capacity to retain water, and ability to support growth of plants.

Science and Technology

Abilities of technological design

- Identify a simple problem.
- Propose a solution.
- Implementing proposed solutions.
- Evaluate a product or design.
- Communicate a problem, design, and solution.

Understandings about science and technology

- Science is one way of answering questions and explaining the natural world.
- Scientists and engineers work in teams.

- Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
- Tools help scientists make better observations and measurements. They help scientists see, measure, and do things they could not otherwise see, measure, and do.

History and Nature of Science

Science as a human endeavor

- Science and technology have been practiced by people for a long time.
- Men and women have made a variety of contributions throughout the history of science and technology.

Unifying Concepts and Processes

Systems, order, and organization

Evidence, models, and explanation

Constancy, change, and measurement

Form and function and measurement