Soil

Earth & Space Science | Lesson Guide

2nd Grade

Photo Description

This image shows a cross-section of soil with different layers stacked on top of each other, like a sandwich. At the top, you can see green plants and grass growing, and below them are different colored layers of dirt—some darker, some reddish-brown—showing how soil is made up of many different materials packed together.

Scientific Phenomena

Anchoring Phenomenon: Why does soil have different layers?

Soil develops distinct layers over time through a process called soil formation or weathering and decomposition. The top layer (topsoil) contains dark, nutrient-rich material made from decomposed plants and animals mixed with minerals. Deeper layers contain less organic material and more broken-down rock. This layering happens because gravity pulls heavier materials downward, and living things break down at different rates. Plants grow in the top layer because it has the most nutrients and best conditions for roots to grow.

Core Science Concepts

* Soil Composition: Soil is made of many different things—bits of rock, dead plants and animals, air, and water all mixed together.

* Soil Layers (Horizons): Different layers of soil have different colors, textures, and materials because of how they formed over time. The top layer is usually darker and better for plants.

* Weathering and Decomposition: Rock breaks down into smaller pieces, and dead plants and animals break down and turn into nutrient-rich material that helps new plants grow.

* Soil as a Living System: Soil is not just dirt—it contains nutrients, water, and air that plants need to survive, and it supports many tiny living things we cannot see.

Pedagogical Tip:

Use the "soil sandwich" metaphor consistently when teaching this lesson. Have students physically layer different materials (sand, pebbles, dark soil, compost) in a clear container to make the concept concrete and memorable. This kinesthetic approach helps second graders understand abstract layering concepts.

UDL Suggestions:

To support diverse learners, provide multiple means of representation: use the photo, create a labeled diagram together, and have students touch and smell different soil samples. For students who need motor modifications, allow them to sort soil materials into cups rather than layering them. Provide sentence frames for discussions: "I notice the _____ layer looks _____. I think it has _____ in it because _____."

Discussion Questions

1. What do you notice about the colors of the different soil layers? (Bloom's: Remember | DOK: 1)

2. Why do you think the top layer of soil is darker than the layers below it? (Bloom's: Infer | DOK: 2)

3. How do you think the plants at the top of the soil help make the soil below it? (Bloom's: Analyze | DOK: 3)

4. If we looked at soil from your school playground, would it have the same layers as this soil? Why or why not? (Bloom's: Evaluate | DOK: 3)

Extension Activities

1. Soil Layer in a Jar: Provide clear jars, water, sand, small pebbles, dark potting soil, and small leaves. Have students layer these materials to create their own "soil sandwich," then observe and draw what they see. They can water it lightly and observe changes over several days.

2. Soil Detective Hunt: Take students outside to dig small holes in different locations (garden, grass, under a tree). Have them collect soil samples from each spot, place them in labeled cups, and compare the colors, textures, and contents. Create a class chart showing similarities and differences.

3. Plant Growth Experiment: Plant fast-growing seeds (like beans) in cups containing only sand, only store-bought potting soil, and a mixture of both. Water equally and observe over 2-3 weeks. Discuss why plants grow better in some materials than others, connecting to soil composition concepts.

NGSS Connections

Performance Expectation:
2-ESS2-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Disciplinary Core Ideas:
- 2-ESS2.A (Earth's Materials and Systems)

Crosscutting Concepts:
- Patterns (Observe that soil layers follow a predictable pattern)
- Structure and Function (Different soil layers serve different functions for plants and organisms)

Science Vocabulary

* Soil: The dark brown or black material on top of the ground that is made of tiny pieces of rock, dead plants, and other things that plants need to grow.

* Layer: A flat sheet or level of something stacked on top of or below something else.

* Decompose: When dead plants and animals break down and turn into nutrients that go back into the soil.

* Nutrient: Something in the soil that plants need to eat and grow strong, like vitamins for plants.

* Topsoil: The top, darkest layer of soil that has the most nutrients and is where most plants grow their roots.

* Weathering: The slow breaking down of rocks into smaller and smaller pieces over a long time.

External Resources

Children's Books:
Dig, Wait, Listen: A Desert Toad's Tale* by April Pulley Sayre (explores soil and decomposition)
Let's Go Rock Collecting* by Roma Gans (introduces soil components and rock weathering)
From Seed to Plant* by Gail Gibbons (shows how soil supports plant growth)

YouTube Videos:
* "Soil Formation: How Soil is Made" – National Geographic Kids (2:45 min) - Shows time-lapse of soil developing from rock and organic material. https://www.youtube.com/watch?v=LLaB-h95yCI

* "What's in Soil?" – Crash Course Kids (4:23 min) - Explains soil composition in an age-appropriate, engaging way with animations. https://www.youtube.com/watch?v=PJjPUIqzb6E

Instructional Note: This lesson builds foundational understanding for later earth science standards about weathering, erosion, and ecosystems. Encourage repeated observations and descriptions using sensory vocabulary (dark, light, rough, smooth, damp, dry) to build scientific language.