

### Materials

- Hand trowel
- Quart-size mason jar with lid (1 jar per soil sample group),
- Masking tape and permanent markers
- Pre-made “soil spectrum” jar
- Water (stored in a jug or large watering can)
- Paper and colored pencils

### Preparation

- A day before this lesson, place two large handfuls of soil in a mason jar. Select soil from the garden or around school grounds. Combine soil with water, shake, and let settle. Leave jar undisturbed until needed.
- Identify 3—4 different garden locations for soil sample stations (ex. raised beds, in-ground beds, pathways, etc). Place a marker by each station.
- Place a piece of masking tape on each mason jar

## PROCEDURE

### Part 1: Take a Soil Sample

- Gather as a class in the garden. Display a handful of garden soil to the group. “Soil types vary tremendously from place to place. The soil found in our garden beds is very different from soil found along a well-traveled dirt pathway. Similarly, soil found in Pennsylvania is much different from soil found in Maine or California.”
- “All soils contain a unique mixture of the three ingredients: sand, silt, and clay.” Introduce pre-made soil spectrum jar. Point out separate layers of sand (top), silt (middle), and clay (bottom).
- “We are going to take soil samples from different spots around our garden in order to compare their unique sand, silt, and clay ratios.” Split the class into 3-4 groups. Lead groups into the garden and assign each a soil sample area.
- Supply each group with a mason jar and hand trowel. Instruct groups to fill their jar halfway with soil. For tougher terrain, have students use a hand trowel to gather their soil sample. When groups have finished, have each group label their jar with the soil sample location.
- Return to the gathering area, keeping students in their groups. Fill each jar with water until nearly full and securely re-attach the lid. Have students take turns vigorously shaking their jars.
- Return to the classroom. Place soil samples in an area the classroom where they can remain undisturbed as they settle into separate layers. Return to soil samples in 1—2 hours to complete the second part of this lesson.

### Part 2: Examine Results

- Arrange groups from part 1 around large tables or clusters of desks. Revisit the pre-made soil sample from part 1 and have students identify each layer. Make an illustration on the board, labeling sand, silt, and clay layers.
- Select a student from each group to *very carefully* transport their soil sample back to the work area. Remind students not to disturb their soil sample once it arrives at their table. Distribute permanent markers. Have students draw lines directly onto their jars separating each distinct layer of material.
- Then, have each group draw their unique soil spectrum onto a piece of paper. Collect illustrations and tape them to the board. Alternately, have students move around the classroom and examine each soil sample.
- Compare results. “Were there any differences between locations? Which location had the most clay? The most sand? Was there any difference between raised bed and in-ground garden soils? Discuss.”

### ENGAGE

Display containers of sand, silt, and clay on a table. “On this table, I have three mystery materials.” Beginning with clay, move around the classroom and have students examine the sample using only their eyes. “Can you guess what this is?” If students are stumped, allow them to touch the sample. After students have correctly named the material, list it on the board. Repeat the same process for sand and silt. “These three materials are very important ingredients in our garden soil. Different combinations of each will yield different types of soil.

### Objectives

- Students will be able to identify the inorganic components of soil (sand, silt, and clay) using a garden soil sample
- Students will understand how different ratios of sand, silt, and clay create different soil conditions
- Students will understand how sand, silt, and clay ratios affect garden soil quality

### EXPLAIN

#### Organic vs. Inorganic Soil Ingredients

Soil is made up of four main parts: organic materials, inorganic materials, air, and water. Many people are familiar with the organic ingredients in our garden soil, such as living creatures, decaying plant and animal materials, and invisible microorganisms. These organic materials play a vital role in maintaining overall soil health, however, they make up a very small portion of the soil. Inorganic materials such as sand, silt, and clay make up more than half of the soil’s total mass. Here’s a breakdown of each inorganic ingredient:

- **Sand** – Contains the largest of soil particles. Grains are fairly round, producing tiny pockets of air in between particles. The air space between sand particles allows for quick water drainage.
- **Silt** – Particle size is in between sand and clay. Silt particles are uniformly round and arranged in slightly denser layers than sand. There is still a bit of air space in between particles, which allows for water drainage.
- **Clay** – Contains the smallest particles. These plate-shaped particles are densely packed together and have very little space between them. Therefore, water cannot easily drain through this layer.

Different combinations of sand, silt, and clay produce vastly different soil types. Garden plants require well-balanced soil in order to thrive, so determining the proper sand, silt, and clay ratio for your garden soil is important. Even less-than-ideal garden soils can be amended to achieve a better balance of materials.

### ADDITIONAL CONTENT INTEGRATION *(see previous page)*

First have students record the total amount of soil collected in their jar, using the markings on the side of the mason jars to assist with measurement. Then, have groups determine the percentages of sand, silt, and clay present in their sample. Have groups record percentage results on a piece of paper. Finally, demonstrate how to use the “Soil Triangle” illustration to determine soil type. Have students align their percentage data with the “Soil Triangle” in order to determine their unique soil type.

#### Additional Materials

- Sand, silt, and clay samples, placed in small containers
- “Soil Triangle” illustration

### EVALUATE

**Journal prompt:** Draw an illustration of your settled soil sample and label the different layers.