

Sifting Through the Soil: A Classroom Activity

(Grades 3–4)

In this activity, students will identify and understand the major components of soil and the importance of soil to plants and animals, including humans.

Time Required: Three or four 45-minute classes

Purpose: Students will investigate the soil and be able to do the following:

1. Describe the ways that soil is important to animals, humans and plants;
2. Identify soil components by the way they feel and look;
3. List the major components of soil (rock, sand, silt, clay, humus); and
4. Identify soil textures using the sense of touch.

1995 Virginia Science S.O.L.s: 3.7, 4.8, 5.7

Museum Connection: To further explore the concepts and S.O.L.s covered in this activity, visit the following exhibits found in the **Really Big Gallery**:

Eat or Be Eaten, Friends or Foes, Hirschler Aquarium, Go With the Flow, and Earth Watcher.

Materials:

Per Group

3 small brown paper bags
garden trowel or small shovel
newspaper
3 paper plates
5 Dixie[®] cups

Per Student

Texture Observations: Student Activity Sheet
Soil Textures: Student Information Sheet
magnifying glass



Per Class

- 1 small bag of humus
- 1 small bag of sand (sand box or construction grade)
- 1 freezer-size bag of clay (Clay can be collected outdoors.)
- 1 freezer-size bag of silt (Stream bottoms are often a good place to find silt.)

Note: Silt is often difficult to find. If you cannot find it, flour can be substituted for the dry observations portion of the activity.

- spray bottle filled with water
- bucket of water for rinsing hands
- paper towels

Prerequisite Skills and Knowledge:

- humus** – Dead and decaying organic matter (plant parts). Humus improves the water-holding capacity of soil and supplies nutrients to plants.
- sand** – Soil particles that are loose, single grained and gritty. Sand does not hold water well and has poor nutrient content.
- silt** – Silt is made of medium-sized soil particles that have a texture resembling baking flour. Silt is almost always found mixed with clay and sand.
- clay** – Clay is a very fine-textured soil that is very sticky when it is wet. A soil with high clay content has very small pores, so it is difficult for water to enter the soil. However, once the water is in the soil the water does not move through it. Therefore, clayey soils cannot be used for septic systems, and organic matter must be added before plants can grow well in them.
- loam** – An even mixture of sand, silt and clay soil particle sizes. When wet, it feels gritty, yet smooth and is not very sticky.
- topsoil** – The top layer of soil, which contains the highest concentration of organic matter and is dark in color. Topsoil is formed when decaying plants and animals mix with the soil, creating a new layer, high in nutrients and organic matter. Plant roots are found primarily in this layer. Topsoil is not always present in a soil profile.
- bedrock** – The solid rock that underlies soil.



Teacher Preparation for Activity:

Take a walk around your school grounds or nearby woods and decide on a good path for your Soil Walk Activity. Locate three sites with different types of soil. Soils will vary based on location. Some good places to look are the following: near streams (sandy soils); flowerbeds (humus and topsoil); near the school building (clay or loam); and in the woods (clay, loam and humus). If you cannot locate sand or humus, both can be purchased at a local garden center. Mark your chosen digging spots; make sure it is safe to dig a small hole at each site that you locate. Take notice of trees, flowers, shrubs, buildings and playground equipment along your walk. Students will need to point these out as things that need soil for support. Collect a small amount of soil in a clear plastic bag to use in class.

Getting Started:

Hold up the clear bag of soil and ask students what the bag contains. Many students may call it “dirt.” Scientists, however, do not use this word. “Dirt” is considered misplaced soil.

Write the words “soil and humans” on the board. Brainstorm with the class about why soil is important to humans. Write the ideas on the board. Next to this list, write the words “soil and animals.” Brainstorm about why soil is important to animals. Then have another brainstorming session for the heading “soil and plants.”

Example Chart

Soil and Humans	Soil and Animals	Soil and Plants
Building foundations Growing food Landscaping Plants	Plants for food Shelter Food Bury things in it	Support Nutrients Water Seed protection

Once students have finished brainstorming, compare the three columns. What are the similarities and differences? Are all living things dependent on soil in some way?

Soil is truly the foundation of life on Earth. Without soil, most plants could not live. Plants take in carbon dioxide and give off oxygen. Could we breathe if there were not any plants?



Plants also provide food for animals (including you and me). Would we have anything to eat if there were no plants on earth? Could we survive?

Soil Walk Activity: Give the students the following instructions.

Let's take a walk around the school. Look for examples of how soil is helping humans, plants and animals. We will also be collecting soil samples at various stops along our walk.

Procedure:

1. Divide students into groups of two to four. Give each group one small paper bag per dig site, a marker, and a hand trowel.
2. Write the names of each group member on the group's bag.
3. Take the class on the pre-determined soil walk. Be sure to stop periodically and have students point out examples of how humans, plants and animals are benefiting from the soil.
4. At each designated dig site, have each group fill one bag with a cup of soil.
5. After they fill the bag with soil, the students should label the bags with the location where the soil was collected.
6. Return to the classroom and lay out newspaper in an area that will not be disturbed overnight. Hand each group three paper plates.
7. Students should label the bags 1, 2 and 3. Then, they should label the plates 1, 2 and 3. Next, empty the soil samples onto the corresponding plates. Leave the samples out to dry overnight.
8. Once the soil is dry, empty the plates back into the corresponding paper bags. These bags will be used for the next part of the activity.

Activity Conclusions:

When scientists take soil samples, they must always label where the soil came from. Why do you think this is important?

It is important for scientist to know the location from which the soil came when they are trying to classify it. If the sample was collected near a river or stream, then it was carried there by water; if the sample was collected at the bottom of a mountain, the soil probably arrived there due to gravity pulling it down the sides of the mountain. If the soil was collected in the middle of a flat pasture, then the soil was probably formed from the bedrock beneath the pasture. Scientists should always label their samples. Scientists never know when they might need the information!



Soil Texture Activity (Warm Up):

In this activity, you will need to prepare five soil particle samples for each group. Give each group five Dixie[®] cups: one containing a small sample of sand, one containing clay, one containing silt, one containing humus, and one containing loam (an equal mixture of sand, silt and clay). Label the cups.

Arrange students into the same groups they were in for the soil walk and pass out the soil particle samples. Discuss the information on the Soil Texture: Student Information Sheet with the class. Be sure that students feel each soil texture as you discuss it. Have the students write down descriptor words for each soil.

After they have felt the dry soil, you may want to let students feel the soil when it is wet.

Procedure:

1. Place newspaper over desks. This activity gets messy!
2. Return the paper plates and the soil sample bags filled with dry soil to the students.
3. Pass out a Texture Observation: Student Activity Sheet and magnifying glass to each student.
4. For the first observation, students should use their sense of touch to make observations about each soil. They should place their hands in the bags and write down words to describe how the soil feels on their student activity sheets.
5. The next observation should be made using the sense of sight. Students should put a small amount of each soil on a white piece of paper and use the magnifying glasses to look at the soil particles. They should record their observations in the chart provided.
6. The third observation should be made using moist soil. Have each student gather a small handful of soil. Spray the soil with a water mister until it is moist. Students should rub the soil between their fingers and write down their observations. **Have a bucket of water available to the students for rinsing their hands!**
7. Finally, the students should compare their descriptor words for the soil in each bag with the descriptor words for sand, silt, clay, loam and humus. They should record the textures that relate to the soils in each of their bags. Then they should answer the questions provided.



Activity Conclusions:

Why do we need to know the texture of a soil?

When we know the texture of a soil, it helps us determine the best use for the soil. If we are planting plants, knowing the soil texture gives us clues as to what we might add to the soil for best plant growth.

Would you want to plant your garden in red clay? Why?

You would not want to plant a garden in red clay because the soil is hard, making it difficult for roots to grow. It is also difficult for the plant to get water.

How is soil formed?

Soil is formed when bedrock weathers and breaks down into smaller parts. These parts eventually become the soil. Topsoil is formed when organic matter breaks down and mixes with the top layer of soil.

Assessment:

1. Provide each student with an unlabeled, damp sample of soil. Have students feel the soil and write down the texture words that apply.
2. Write a story about what life would be like without soil. Who would live on the Earth? What kind of plants would we have? Would there be any animals? What would they eat? Encourage students to be creative, but check to make sure that they understand the relationship between life on Earth and soil.

Extension Activities:

1. Complete a class experiment to find out in which soil plants grow best. Make a hypothesis ranking the soils from best to worst for plant growth. Grow plants in pure samples of clay, silt, sand and humus. Grow one plant in a mixture of equal parts of each soil component. (This soil is called **loam**.) Make sure that all of the plants have equal amounts of water and sunlight. Do not fertilize! Allow the plants to grow for a month, making observations about the plants and the soil every day. Which plants grew the best? Why do some soils work better for growing plants than others? What kind of soil would you want in your garden? If the plants had been fertilized, what might have happened?
2. Do a research project on the soil conservation practices in your area. Contact your Soil Conservation Service for information.
3. Have a soil scientist come speak to the class.
4. Take a walk around your school grounds. Locate places where soil is eroding and think of ways to prevent the erosion. You may want to plant ground covers, petition for a sidewalk, or plant grass. Your local extension agent should be able to help with this effort.



Texture Observations: Student Activity Sheet

Name _____

Date _____

Touch Observations with Dry Soil

1. Make observations about each soil by placing your hand in each bag and feeling the dry soil. Is it gritty or smooth? Does it stick to your fingers? Don't peek! Only use your sense of touch!
2. Using descriptive words about how the soil feels, write down your observations in the space provided.

Bag Number	Location of Soil	Observations
1		
2		
3		

Sight Observations with Dry Soil

1. Empty each bag onto the appropriate paper plate. (These should already be labeled.)
2. Complete the following chart while looking at the soil with the magnifying glass. Be as descriptive as possible. What shapes do you see? Are the particles large or small? What colors do you see?

Bag Number	Location of Soil	Observations
1		
2		
3		



Touch Observations with Wet Soil

1. Your teacher should come around and wet your soil with a spray bottle.
2. Once your soil is wet, rub it between your fingers. Write down your observations below. Is it sticky? Gritty? Smooth? Gummy? Does it have pebbles in it? What does the soil feel like?

Bag Number	Location of Soil	Observations
1		
2		
3		

Compare your observations with the observations of other members of your group. Together, answer the following questions. Be sure that everyone writes the answers.

Texturing Your Soil

1. Using your observations decide on a texture for each soil, and write it in the chart below. A soil may have more than one particle size, so write all textures that apply.

Bag Number	Soil Texture Humus, Clay, Loam, Sand, Silt

2. Which soil texture do you think is best for plant growth? _____
3. Would you find more humus in a pasture or the forest? _____
4. Which soil particle do you find the most of at the beach? _____
5. Why is soil important to both humans and animals? _____

6. Why is soil important for plant growth? _____



Soil Textures: Student Information Sheet

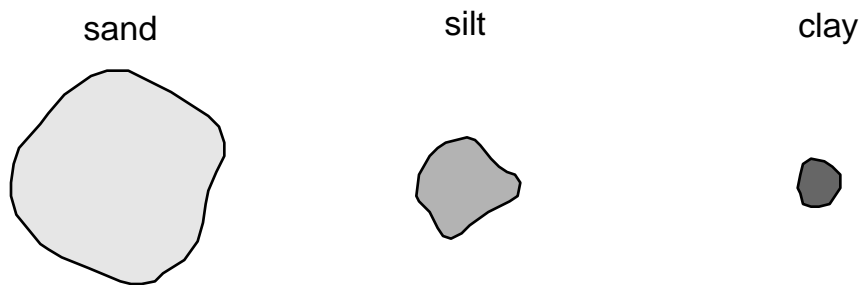
Name _____

Date _____

Why do we need to know a soil's texture?

Scientists look at many different factors when they classify soils. One of the major factors that they consider is the soil's **texture**. A soil's **texture** is determined by how much sand, silt and clay the soil contains. Scientists determine whether a soil particle is sand, silt or clay based on its particle size and mineral make-up. We often determine a soil's texture by using the senses of touch and sight. Once you know how different soils feel and look, it is easier to determine the texture of all soils.

There are three major soil particles:



Sand is the largest soil particle. Sand feels gritty. If your soil sample feels gritty when you rub it between your fingers, then it contains some sand.

Silt is the middle-sized soil particle. Silty soils feel very soft, like baking flour. When it is wet, silty soil feels very smooth.

Clay is the smallest soil particle. Clay soils are usually red and sticky. Clay sticks to your fingers. When it is wet, it often feels like gum. You may have called this substance “red mud.”

Loam is made of an even mixture of sand, silt and clay soil-particle sizes. When wet, it feels gritty, yet smooth, and it is not very sticky.

Humus is not a soil particle, but it is often found in the first layer of soil called **topsoil**. It is made of decaying plants and animals. We call this decayed material **organic matter** because it is made from once living things. It is black in color, and has a slight odor. Plants grow very well in soils that have a lot of humus, and you may have added it to your garden.

Rock is also a component of soil. Soil is made from rock and bedrock breaking down into smaller parts. Though rock is not a soil texture, scientists do record how much rock and the size of the rock found in soil.

