Soil

Lesson Plan for Grade 4, Science

Prepared by NAITC

Modified by Mississippi State University, School of Human Science

for Mississippi Farm Bureau Federation - AITC

# OVERVIEW & PURPOSE

Students examine different types of soil that have been mixed with water and allowed to settle. They will investigate soils components (sand, silt, and clay), while also graphing and taking measurements of each. Students will discuss and recognize what natural resources are and why they are important to the life cycle of plants and animals.

# EDUCATIONAL STANDARDS

**Mississippi College-and-Career Readiness Standards:**

L.4.2.1 Compare and Contrast the life cycles of familiar plants and animals.

ELA-SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others’ ideas and expressing their own clearly.

4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm, mm; kg, g, mg; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36),…

**NALOs:**

T1.3-5 e Recognize the natural resources used in agricultural practices to produce food, feed, clothing, landscaping plants, and fuel (e.g. soil, water, air, plants, animals, and minerals).

T2.3-5 e Understand the concept of specific ways farmers/ranchers care for soil, water, plants, and animals.

# OBJECTIVES

* Students will analyze the components of soil
* Students will determine the silt, sand, and clay of soils in the student’s surrounding areas
* Students will discuss the resources needed to grow food and fiber
* Students will examine why crop rotation is important to farmers

# MATERIALS NEEDED

Day 1

Activity 1:

For each group:

* Flour (1 bag)
* Sugar (1 bag)
* Water (1 gallon)
* Glass jar with lid (one for every two students)
* Three different buckets of soil. (This should not be from a flower bed or purchased in a store. This is not true soil. This has to come from a garden, or yard etc.)
* Permanent marker (1 pers student)
* Ruler (1 per student)
* Paper towels (1 roll per group)

Day 2

Activity 2:

For the teacher:

* Soil samples from a variety of locations (about three different samples) (Have enough for each group to get a sample.
* Paper cups (3 per group)

For each group:

* Three paper cups per group with a different soil sample in each
* Permanent marker
* Jars made the day before with soil samples in them
* Rulers for each student
* [*What's Soil Made of?*](https://docs.google.com/document/d/1KDYYX-xbX9FTx1iMjQd0FyMNV5pVHFo5qAI-2_FAbmE/edit) Handout (1 per student)
* [Reflection Sheet](https://docs.google.com/document/d/1YWx92FvLuEL5LlFWuY6XPdAjMEWVcjyXNMCs4UoGgVw/edit) (1 per student)

# Lesson Set Up:

Day 1:

1. The teacher will need to obtain 3 large buckets of soil from 3 different locations. (Note: this should not be purchased or obtained out of flower beds. This is a soil medium and not considered “soil”.) Make sure to label these #1, #2, and #3 soil to keep them separated.
2. The teacher will need to fill enough cups (1 per group of students) with sugar and one cup (1 per group of students) with flour.
3. The teacher will also need to fill one cup (1 per group of students ) with water.
4. Have one cup of each placed at each group before the lesson begins, or have them set aside.
5. Next, the teacher should have set aside one mason jar (1 per every two students).
6. The teacher should also have a source of water (from bottles or a sink), for the students.

Day 2:

1. The teacher should have a “What is soil made out of?” worksheet and a reflection sheet printed for each student.
2. There should also be markers and rulers available for each pair of students.

# VOCABULARY

**Clay:** fine granular material composed of closely packed particles.

**Loam:** ideal garden soil that has a well-balanced mixture of sand, silt and clay

**Sand:** coarse granular material composed of finely divided rock and mineral particles.

**Silt**: sedimentary material composed of fine mineral particles in size between sand and clay.

**inorganic:** not consisting of or derived from living matter

**organic**: a substance of, relating to, or derived from living matter

# Ag Facts:

* The process by which minerals move down through soil is called leaching.
* In a teaspoon of good soil there will typically be several hundred million bacteria.
* The average acre of good cropland will be home to over 1 million earthworms.
* Soil is mostly made of the elements oxygen, silicon, aluminum, iron, and carbon.
* It is possible to over-farm soil and remove so much of its nutrients and organic matter that plants will no longer be able to grow in it.

# Background Information for Teacher:

**What is soil?**

Soil is the loose upper layer of the Earth's surface where [plants](https://www.ducksters.com/science/biology/plants.php) grow. Soil consists of a mix of organic material (decayed plants and animals) and broken bits of rocks and minerals.

**How is soil formed?**

Soil is formed over a long period of time by a number of factors. It can take up to 1000 years for just an inch of soil to form. Besides time, other factors that help soil to form include:

* Living organisms - This includes organisms such as plants, [fungi](https://www.ducksters.com/science/biology/fungi.php), [animals](https://www.ducksters.com/animals.php), and [bacteria](https://www.ducksters.com/science/bacteria.php).
* Topography - This is the relief or slope of the surface of land where the soil is forming.
* Climate - The overall climate and weather where the soil is forming.
* Parent material - The parent material is the minerals and rocks that are slowly At first you may think of soil as just dirt. Something you want to get rid of. However, soil plays a very important role in supporting life on Earth.
* Plants - Many plants need soil to grow. Plants use soil not only for nutrients, but also as a way to anchor themselves into the ground using their roots.
* Atmosphere - Soil impacts our atmosphere releasing gasses such as carbon dioxide into the air.
* Living organisms - Many animals, fungi, and bacteria rely on soil as a place to live.
* Nutrient cycles - Soil plays an important role in cycling nutrients including the carbon and nitrogen cycles.
* Water - The soil helps to filter and clean our water.

**Properties of Soil**

Soil is often described using several characteristics including texture, structure, density, temperature, color, consistency, and porosity. One of the most important properties of soil is the texture. Texture is a measure of whether the soil is more like sand, silt, or clay. The more like sand a soil is the less water it can hold. On the other hand, the more like clay soil is, the more water it can hold.

**Soil Horizons**

* Soil is made up of many layers. These layers are often called horizons. Depending on the type of soil there may be several layers. There are three main horizons (called A, B, and C) which are present in all soil disintegrating to form the soil.

# LEARNING PROCEDURES

# Day 1:

1. The teacher should start out by reading the following to the class:

“The Earth’s soil is a very important resource. Without healthy soil we would not be able to grow the plants we need for food, fiber, and shelter. There are many different types of soil and each is made up of different components, not just dirt! Soil is composed of three different types of particles that are classified as **sand**, **silt**, or **clay**.

The rock material in soil has been broken down over a very long time into smaller and smaller pieces by “weathering,” which happens when rock and soil are exposed to wind, water, and changing temperatures. Water and air are also found in soil. Water, air, and rock particles are the **inorganic** components of soil, which means these components are not living and never were living. The **organic** components in soil are living, or were once living, organisms. Examples of organic soil materials include decayed plant and animal waste, worms, insects, bacteria, and more. Healthy soil is a mixture of a variety of inorganic and organic materials.

In this activity you will carefully dissect a soil sample to find out what it is made of. Farmers carry out soil tests like this on a regular basis. Farmers want to know the properties of their soil because it plays a role in the amount of nutrients that are available for plants to use.”

2. The teacher should then emphasis the following points about the lesson to the class:

* Soil is a natural resource that farmers use to provide our food.
* Soil is necessary to grow the plants which provide food for humans and animals. Soil is also used to grow plants which provide clothing (cotton) and fuel.
* Soil contains mineral matter and organic matter. It also contains water and air.

### 3. Interest Approach – Engagement

1. The teacher should lead the following discussion:

**"What is a natural resource?" (students may say something that comes from the ground).**

Answer: Examples of natural resources such as minerals in the ground, forests, water, and fertile land and soil. Natural Resources occur naturally. We do not have to make them because nature does. Natural resources can be renewed so they can also be known as renewable resources. A forest is renewable because it can be replanted.

**“What is a nonrenewable resource?” (students may say something about it cannot be grown or made)**

Answer: A nonrenewable resource is something that is only available in limited supply, because it takes a long time to be replenished. Like gas that we put in our cars took millions of years to form and we cannot make gas so it is a nonrenewable resource.

**“What is a recyclable resource?” (students may answer something that can be made into something else)**

Answer: A recyclable resource or a product that is produced and can be broken down to make something new. Like we can recycle plastic water bottles to be turned into ink pens.

**"Where does our food come from?"** (Students might say the grocery store)

Answer: give specific examples of food such as apples, lettuce, corn, etc. Point out that each of these foods grow from plants in the soil.

**"Is soil a natural resource?" (Hopefully students will say yes)**

Answer: Yes!

4. Inform students that they are going to be learning about the importance of soil, a natural resource and how important it is to farmers in order to grow and produce the food we eat.

5. The teacher should lead the following discussion:

**“What do we as humans need in order to survive? (students may say food, clothing, shelter)**

Answer: We need food, water, clothing, and shelter.

**“What do plants need in order to survive?” (students may say water, sunlight, etc.)**

Answer: Plants need water, sunlight, nutrients, air, and soil.

**“We know that the sun shines down on plants to help them grow and they are planted in the soil and surrounded by air, but how do plants get water?” (students may say from the sky or that we water them.)**

Answer: Plants do get watered when it rains, and we may water them with a watering hose, but think about a big pumpkin patch, if we watered it by hand it would take us a very long time. That's why farmers who grow big fields of plants water their plants through something called irrigation. Irrigation is just a fancy word for watering plants, however farmers use big machines to irrigate their plants. Some farmers use wells and flood their fields, some use big sprayers that travel across their fields and spray water down on their plants, and some farmers use big hoses that have holes in them that drip water into the soil around the plants.

**“Where do you think farmers in Mississippi get their water from?”**

Answer: Underneath the ground there is something called a water reservoir that holds water in it. Many farmers dig wells into the group to pump that water out onto the surface. But some farmers get their water from water reserves that spill over from the Mississippi River. They have these huge levees that they built up to keep that water from spilling over and flooding the towns and cities below them.

**“What do you think would happen if we did not have food, clothing, water or shelter?” (students may answer with we would freeze or be hungry)**

Answer: It would be very difficult for us to survive without them.

**‘What do you think would happen to plants if they did not get the soil, water, sunlight, nutrients, or air they needed?” (students may say they would not survive)**

Answer: Plants would not grow properly and would not produce the fruit and vegetables we need.

**“Today we are going to be looking at one of those components that plants need in order to survive and that is soil.”**

6. Activity 1: Shake, Rattle, and Roll

1. Explain to the class that soil is made of three different types of particles: sand, silt and clay. The perfect soil will contain an even mixture of all three. This is called a loam soil.
2. Give each student a small sample of sugar, representing sandy soil. Explain that this soil does not usually grow plants well, as it dries out quickly and does not let the roots get enough water. Have the students describe the texture. Inform them that this is the way that sand feels. Very gritty. Next, allow students to feel a small sample of dry flour and rub it between their fingers. This is the powdery, silky texture of silt. Finally, add a small amount of water to the flour. This is the texture of clay. Clay particles clump together and compact when dry and drain poorly when wet. Have the students describe the texture.
3. Break students into pairs in their groups. Give each pair of students one mason jar, and cap and lid, some water. Have students in pairs fill their jar halfway with one of the soil samples from the buckets, and the rest of the jar should be filled with water. Make sure to instruct the students to label the jars according to their soil sample number, as well as their names on the top. Have the students take turns vigorously shaking the jar until the larger clumps are broken apart. (Make sure to warn your students to be careful when shaking the jars, as to not break them). Have students place their jars in a safe place and allow at least 24 hours for the soil to settle completely (You can make one ahead of time).
4. Say to the class:**”Today we got to see some examples of the way silt, sand, and clay feel. In the next class session, we will see what the soil in our jars are made out of, and you will be able to see the different layers of silt, sand , and clay”.** Display the following image to students on the board by drawing it and labeling each layer.



5. Explain each layer to the students and inform them that they will get to see these layers the next class session in their jars.

6. Have students complete Soil reflection sheet #1

# Day 2:

Interest Approach: Hold up one of the jars made the day or the class before in front of the class. Show students that the soil inside has settled into the three layers of sand, silt, and clay. Use a permanent marker to draw a line to mark each layer.

1. Pass out the “What is soil made out of?” worksheet, one to each student.
2. As a class, read the top of the worksheet, and the instructions to the class.
3. Have students obtain their jars in partners and instruct them to mark each layer they see with their markers.
4. Have students graph their layers and label them by inches or centimeters on the top of their worksheets.
5. Instruct students to hold on to their worksheets for the next part of their lesson.

6. Activity 2: What's Soil Made Of?

1. In each group, place each soil sample (should be 3 in plastic cups) in the middle of each group of students. Make sure they are labeled by the soil number according to the outside of the bucket.
2. Have students go through each soil sample in groups and answer the remaining questions on the worksheet.
3. Have students turn in worksheets how they normally would.

7. The teacher should lead the following discussion:

**“What do you think farmers do when soil runs out of nutrients because the plants he planted used up all of them?” (Students might say they do not use that soil anymore)**

Answer: Different plants produce and use different nutrients. Because of science, farmers know what those nutrients are. They plant different crops in their fields each year to make sure that their soil is not losing all of its nutrients and this is called crop rotation.

**“What do you think farmers do when it has not rained in a long time and their soil is starting to dry out?” (Students might say they water it)**

Answer: Farmers use different techniques to water their crops called irrigation. If farmers could not get water to their crops, many of them would die.

**Concept Elaboration and Evaluation**

* After conducting these activities, review and summarize key concepts by having students complete the reflection sheet. After students turn this in, review and discuss the correct answers.

# Additional Learning Procedures

To help students review and elaborate more about soil, try using the [“The Carousel”](https://drive.google.com/file/d/1OwaltnXQnEXLQcxM7k1puoyferSukPky/view?usp=drive_link) method to allow students to think deeper and make new connections.

Additional Texts to Include:

[The Dirt Book](https://www.agfoundation.org/recommended-pubs/the-dirt-book-poems-about-animals-that-live-beneath-our-feet)

[My Delicious Garden](https://www.agfoundation.org/recommended-pubs/my-delicious-garden)

[Soils Ag Mag](https://www.agfoundation.org/recommended-pubs/soils-ag-mag)



Source: <https://www.agclassroom.org/teacher/matrix/>

*For more information and additional lessons visit*

*https://msfb.org/ag-in-the-classroom/lesson-plans/.*