Soil

*Lesson Plan for Grade 3 , Science*

*Prepared by NAITC*

*Modified by Mississippi State University, School of Human Science*

*for Mississippi Farm Bureau Federation - AITC*

# OVERVIEW & PURPOSE

Students will discover that different soils have different characteristics, examine different types of soil, investigate soil components, and observe how air space allows soils to hold and transmit water.

# EDUCATION STANDARDS

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

E.3.7B.1 Obtain and evaluate scientific information (e.g. using technology) to describe the four major layers of Earth and the varying compositions of each layer.

Math-3.OA.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7*.

**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 c Explain how the availability of soil nutrients affects plant growth and development.

# OBJECTIVES

* Students will list aspects of soil composition
* Students will recognize that soils vary in composition
* Students will provide examples of ways that soils differ in their ability to absorb water

# MATERIALS NEEDED

Activity 1: Properties of Soil

* 3 clear, 12 oz (29.5 mL) plastic bottles
* Potting soil, 10 oz (283 g) (see *Preparation Instructions*)
* Local soil, 10 oz (283 g) (see *Preparation Instructions*)
* Sand, 10 oz (283 g) (see *Preparation Instructions*)
* Water
* Funnel (optional)

Investigation 1: Looking at Soil Samples

* *Master 2.1*, 1 copy per group
* *Master 2.2*, 1 copy per student
* Hand lenses, 2 per group
* Potting soil (labeled "Soil A"), 1 teaspoon (5 g) per group
* Local soil (labeled "Soil B"), 1 teaspoon (5 g) per group
* Plastic spoons

Investigation 2: Soil and Air Space

* *Master 2.3*, 1 copy per student
* Clear 9 ounce (29 mL) plastic cups (approximately 3" (7.62 cm) tall and 3.75" (9.52 cm) across the top), 3 per group
* Permanent marker, 1 per group
* Potting soil, 1/2 cup (170 g) per group
* Local soil, 1/2 cup (170 g) per group
* Sand, 1/2 cup (170 g) per group
* Small paper cups containing 1/2 cup (120 mL) of water, 3 per group
* Ruler, 1 per group
* [Properties of Soils Lesson Video](https://youtu.be/Pu8uw5JPLEI)
* Reflection Sheet (1 per student)

### Essential Files (maps, charts, pictures, or documents)

* [Master 2.4](https://drive.google.com/file/d/19koWwrERfkB8ZzdHXCQHP6uG0wWpd1K1/view?usp=drive_link)
* [Master 2.3](https://drive.google.com/file/d/1JuOoKM0FY4IHcG5pOMtJFtPbSJ4SVTi3/view?usp=sharing)
* [Master 2.2](https://drive.google.com/file/d/1QIUR-zve3-iiJpqSPhQQA9gOTxJbk1L0/view?usp=drive_link)
* [Master 2.1 & Key](https://drive.google.com/file/d/1MJNEXCUTof7fB4Y3fa6gjmXJ81RQib0y/view?usp=drive_link)
* [Preparation Instructions](https://drive.google.com/file/d/1B7YxMM5PbeGQXhz-vi-QXkbKs32cPIwb/view?usp=drive_link)
* [Reflection sheet](https://docs.google.com/document/d/1lUmmcWPPHA0vdc8wd-VcBvDx1GA2v-b5/edit?usp=sharing&ouid=109918902593538910659&rtpof=true&sd=true)

### Essential Links

* [Properties of Soils Lesson Video](https://youtu.be/Pu8uw5JPLEI)

# Lesson Set Up:

1. Have the board or chart paper ready to record student responses for activity 1.
2. Have the 3 different bottles of soil and water that have settled fixed 24 hours prior to the lesson. (Place the soil and water in the bottle. Shake vigorously. Place in an area and do not disturb for 24 hours. The different sediments in the soil will settle together making distinct lines. Print 1 copy per group of the *Master 2.1*, and 4 copies per group of the *Master 2.2*, 2
3. Have the teaspoons of soil A and B, plastic spoons, and hend lenses ready for the groups to use.
4. Print the reflection sheet (1 per student)

# Vocabulary

**inorganic:** composed of material from nonliving sources; rocks, sand, and minerals are examples of inorganic materials

**organic:** living or once-living organisms; derived from living organisms

**percolation:** the process by which water moves downward through openings in the soil

**porosity:** the percentage of soil volume that is not occupied by solids

# Ag Facts:

* There are more microorganisms in a handful of soil than there are people on earth
* It takes 500 years to produce just under an inch of topsoil, this is the most productive layer of soil.
* It greatly reduces flood risk by storing up to 9200 tonnes of water per acre. In total that’s about 0.01% of the Earth’s total water.
* Soil is a living system.
* Soil acts as a filter for underground water, filtering out pollutants.

# Background Information for Teacher:

In 1988, the Professional Soil Classifiers Association of Mississippi selected Natchez silt loam soil to represent the soil resources of the State. These soils exist on 171,559 acres (.56% of the state) of the landscape in Mississippi.

The Natchez soils formed in very deep loess; material under a woodland environment and a climate that was warm and humid. These soils have natural fertility and desirable tilth but usually occur on slopes that limit their use to trees. In areas where slopes are less, pasture and row crops are grown and the soil is very productive when good management is applied.

A typical Natchez soil profile consists of a 3 inch topsoil of dark grayish brown silt loam and to 8 inches, a subsurface of brown silt loam, yellowish brown and dark yellowish brown silt loam subsoil to 36 inches and a substratum that is yellowish brown, and dark yellowish brown silt loam down to 80 inches. (usda.gov)

# LESSON PROCEDURES

Interest Approach:

1. Ask the students the following introductory questions:

* **Do soils vary in their compositions?**
* **Do soils contain materials from both nonliving and living sources?**
* **Does soil contain air?**
* **Do soils differ in their abilities to hold and transmit water?**

Activity 1: Properties of Soils

1. Review with students that plants need nutrients in soil to grow. Ask students, **“What is soil?”** and **“What is found in soils?”** Write students’ responses on the board or chart paper.
2. Continue the discussion by asking students, **“Can you group the items from the chart into different categories?”**
3. Ask students what they would put in the different categories. Record their responses on the board or chart paper. Guide the discussion to bring out the fact that soil consists of nonliving material, such as sand, silt, and clay, as well as living material, such as bacteria, insects, worms, and the remnants of previously living organisms (e.g., dead plant material or even the bodies of decomposed dead animals such as insects). Materials from living or once living organisms can be called organic, and nonliving materials such as clay, rocks, or sand are inorganic materials.
4. Inform the students that they will be observing different kinds of soil to learn more about what is in them. Show the class the bottles of potting soil, local soil, and sand that were previously mixed with water and allowed to settle. Explain how they were prepared. Ask the students to gather around the bottles and record their observations about the different soils. Caution students not to pick up or move the bottles.
   * The potting soil will show a thick layer of dark material on the bottom, a thick layer of cloudy water, and a thinner layer of material on the top.
   * Local soils may differ, but a typical soil will show layering similar to potting soil, though there may be less material floating on the surface.
   * Most of the sand will form a very thick layer on the bottom of the container. There will be a thick layer of clear water and a very thin layer of material on the surface.
5. Remind the students of the categories that they created earlier (*Procedure 2*). Ask the students if they can tell which categories match up with the different layers in the bottles.
6. Point out the thin layer that floats on the surface. Inform students that this material is mostly made up of the materials in soil that came from organisms that were once alive but are dead now and have been decomposed by other organisms in the soil.  
   * If students are not sure how a once living organism would now be in the soil, ask if they have ever seen a tree that has fallen and has started to rot and break down. They may also have seen insects that have died and are in the early stages of decomposition.
   * If students have learned about density, reinforce their understanding of that concept by explaining that some materials in the soil are more dense (e.g., sand and rock) while other materials are less dense (e.g., clay, the organic material floating on top).
7. Explain to the students that the cloudiness in the water comes from small particles called clay. Clay particles are like rock or sand in that they are nonliving. They are very small—so small that they can remain suspended in the water.
8. Ask the students, **“How do soils help plants grow?”** Write students' responses on the board. Some of the ideas students may suggest include:
   * Soils provide support for plants’ root systems.
   * Soils provide nutrients that plants need to grow.
   * Soils hold water and make it accessible to plants.
9. Ask the students, **“Do plants grow well in any kind of soil?”** (*no*)
10. Inform students they are now going to perform two investigations to observe other properties of soil that affect plant growth. For Investigation 1: Looking at Soil Samples, divide the class into groups of four students and provide each group with 1 copy of *Master 2.1*, 4 copies of *Master 2.2*, 2 hand lenses, 1 teaspoon of soil A, 1 teaspoon of soil B, and a plastic spoon.
11. Instruct the students to follow the directions on their handouts, record their observations, and answer the questions on the handouts. Give students approximately 15 minutes to complete their investigation.
12. After the groups complete their investigation, reconvene the class and ask each group to take turns describing their investigation and reporting their results. As necessary, ask guided questions to bring out the following:  
    * Soils differ in their composition.
    * Soils contain nonliving and living (or once-living) things.
    * Visual inspection cannot fully evaluate everything about soils.
13. For Investigation 2: Soil and Air Space, have the students work in their same groups and provide each group with 1 copy of *Master 2.3*, a cup of potting soil, a cup of local soil, a cup of sand, 3 cups of water, a ruler, and a permanent marker.
14. Instruct the students to follow the directions on their handouts, record their observations, and answer the questions on their handouts. Give students approximately 15 minutes to complete their investigation.
15. After the groups complete their investigation, have the students summarize what they have learned about soils by creating a list. Write the list on the board or on chart paper. Students should mention the following:  
    * Soils contain different kinds of materials.
    * Different soils contain different amounts of air spaces between the particles.
    * Different types of soil allow water to pass at different rates.
16. Explain to the students that farmers and gardeners sometimes dig up or till the soil in the spring to loosen it up (make it less compacted) and they may even add decomposed plant and animal materials to the soil.
17. Ask, **"Why do you think they go through these steps to prepare the soil? Can you think of any reason these steps may not be good for the soil?"** (*Breaking up or loosening the soil allows air to get into the soil for better root growth, and it may help water penetrate the soil. Adding organic matter to the soil provides plants with the nutrients they need. Digging up soil is not always good for plant growth because the soil can wash or blow away more easily, and plants need soil. Many farmers have learned how to grow healthy crops without tilling the soil.*)

**Concept Elaboration and Evaluation**

* After conducting these activities, review and summarize the following key concepts by completing the reflection sheet:

# Additional Learning Procedures

To help students review and elaborate more about soil try using the [“Think Pair Share”](https://drive.google.com/file/d/1Od74GA5fZ4dXbFsV89GI1Cw4gYMMU-m3/view?usp=sharing) 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)

[Discover Dirt](https://www.agfoundation.org/recommended-pubs/discover-dirt)

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

*For more information and additional lessons visit*

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