








What's the Scoop on Soil?

Student Field Journal: _____ (page 1 of 6)

Part I: Know Your Facts

Soil	Dirt
 It is a mixture of minerals, water, air, organic matter and lots of organisms.  Vital to life on earth.  Supports plant growth.  It is like a layer of skin that covers the earth.	 Displaced soil.  Gets on your clothes and shoes.  Has lost the ability to support life.



Quick Soil Facts!

Fact #1: Soil is made up of sand, silt and clay.

Fact #2: Different types of soil contain different amounts of sand, silt and clay.

Fact #3: Components of soil (sand, silt and clay) have different physical properties that can be observed, analyzed and described.

Fact #4: All components of soil combine together to create a natural resource that is necessary for the survival of plants because of their ability to retain water, provide nutrients, and support plants.



Tech Timeout: Use your computer to find the answer.

What is a person who studies soil called? _____



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Part II: What do you know about the soil in your outdoor classroom?

In the first column, write three facts that you know about the soil in your outdoor classroom. In the second column, write three questions that you would like to learn about the soil in the outdoor classroom.

AFTER you have completed your soil comparisons, write three new facts that you have learned about the soil in your outdoor classroom.

What I Know	What I Would Like to Learn	What I Learned



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Part III: Collect Samples of Soil

Work with your classmates to collect four soil samples (fill your cup up):

Sample A: From the open school yard. (Use a trowel or small shovel if needed.)

Sample B: From the bog or compost station. (The bog may be located in the Frog & Toad Habitat. Do not collect decaying plant matter with your soil if you get your sample from the compost station.)

Sample C: From a raised bed garden. (This could be from a vegetable garden or other raised bed garden with amended soil.)

Sample D: From under a tree or bush. (Not in a raised bed garden).

Part IV: Compare the Samples of Soil

Comparison #1 - Texture

In this part of the experiment, we are going to determine if the soil is more sand-based or clay-based by using our sense of touch.

Think about how sand can feel gritty. Does the soil feel smooth or gritty?

- ❖ **Smooth** = more clay in the soil
- ❖ **Gritty** = more sand in the soil



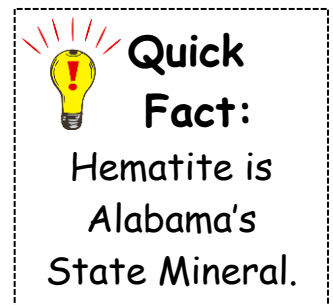
Record your observations about the texture for each sample on the Soil Chart.

Comparison #2 - Color

Now we are going to examine the color of each soil sample to help us determine what types of minerals and organic matter are in the soil.

Match the color of the soil as closely as possible to a soil color below.

- ❖ **Dark Brown or Black** = lots of organic material
- ❖ **Red** = clay type soil with iron (hematite)
- ❖ **Yellowish/Brown/Orange** = clay type soil with iron and other organics



Record your observations about the color for each sample on the Soil Chart.

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Comparison #3-Capacity to Retain Water

For this part of the experiment each team will need a funnel, 4 coffee filters or paper towels, an empty 12 oz water bottle, a full 12 oz water bottle, a 1/3 measuring cup, and a stopwatch.

To test each soil sample's capacity to retain water, place the coffee filter or paper towel in the bottom of the funnel and then put 1/3 cup of Soil Sample A in the funnel. Place the bottom of the funnel in the top of the empty water bottle. Then slowly add 1/3 cup of water from the full water bottle. **Start timing as soon as you start adding the water.** End the timer when all the water has filtered through the soil.

How do I interpret my time values?

- ❖ **The longer the time to drain** = more clay
- ❖ **The shorter the time to drain** = more sand and silt

Record the amount of time it took for the water to pass through the soil into the empty water bottle. Be sure to completely empty the funnel and water bottle container before testing the next sample of soil. Record your observations for each sample on the Soil Chart.



Tech Timeout: Use your computer to find the answer.

What is soil permeability? _____

How does soil permeability relate to the soil's capacity to retain water?



Quick Fact:

Sand and silt are larger particles than clay, which creates more space between the particles allowing for water to filter through quickly.

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Comparison #4-Ability to Support Plant Growth

OPTION 1: Go outside and make general observations about the plant growth and biodiversity in the four different areas where you collected your soil samples. **Record your observations on the Soil Comparison Chart.**

OPTION 2: Test each soil sample by planting a seed in the remaining soil and note the time needed for plants to sprout in each sample. Record your observations on the **Soil Chart.**



Tech Timeout: Use your computer to find the answer.

What is biodiversity? _____

How is the biodiversity of an ecosystem effected by the type of soil? _____

Conclusions: Based on the results of your experiment, answer the following questions.

1. What can you infer about the soil in sample A? _____

2. Why does the soil need to be amended based on sample A? _____

3. How are the soil samples B and C different from each other? _____



Quick Fact:

The ability of the soil to retain water effects not only drainage, but also the types of plants that can grow in the soil.

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Soil Sample Comparison Chart

Record your observations for each of your four soil samples below:

Sample	Texture	Color	Capacity to Retain Water	Ability to Support Plant Growth
A				
B				
C				
D				

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Teacher Tips (page 1 of 3)

Materials Needed

- 6-8 hand trowels or small shovels for digging (one for each team)
- (24+) 16 oz plastic cups (one for each student)
- (6-8) 8 oz funnels (one for each team)
- (6-8) 4 coffee filters or paper towels (one set of 4 for each team)
- (6-8) 12 oz empty water bottles (one for each team)
- (6-8) 12 oz water bottles full of water (one for each team)
- (6-8) 1/3 cup measuring cups (one for each team)
- (6-8) stop watches (one for each team)
- (24+) copies of Student Field Journal (pages 1-6) - three-hole punched so students can insert the pages into their outdoor classroom field guides. (one for each student)

Part I: Background Info

- Review the background information about soil (from page 1) with your students.
- Essential questions that will be discussed throughout the activity:
 - ❖ Where do we find soil in the Outdoor Classroom?
 - ❖ What types of soil will we find in the Outdoor Classroom?
 - ❖ How does soil composition effect drainage in our Outdoor Classroom?
 - ❖ How does soil composition plant growth in our Outdoor Classroom?
 - ❖ How does soil enrichment improve plant growth in our Outdoor Classroom?
- If the students have access to computers (or tablets/laptops), ask them to use their devices to find out what a person who studies soil is called.

Part II: What the students know about the soil in the outdoor classroom

You could complete this part of the activity inside, but if you complete it in the outdoor classroom you may activate student's prior knowledge because the activity is in context.

- Have the students write the facts about soil that they already know in the first column of their charts on page 3.
- Then have the students write questions that they would like answers to in the middle column of their charts on page 3.

Note: Students will not fill out the third column until AFTER they have completed their soil comparisons.



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Teacher Tips (page 2 of 3)

Part III: Collect Soil Samples

- Break your class into teams of four students each. This will minimize the soil collection in your Outdoor Classroom.
- Give each student a 16 oz plastic cup to collect a soil sample in.
- Give each team a hand trowel or shovel for digging up their soil samples.
- Have one student from each team mark their cups with the letter "A" and fill the cup with soil from the open school yard.
- Have one student from each team mark their cups with the letter "B" and fill the cup with soil from the bog or compost station. (The bog garden is the artificial wetland station, which may be found in the frog and toad habitat. Only use soil from the compost station if the plant matter has already decomposed.)
- Have one student from each team mark their cups with the letter "C" and fill the cup with soil from a raised bed garden. (This could be from a vegetable garden or other raised bed garden with amended soil such as the butterfly garden or sensory garden.)
- Have one student from each team mark their cups with the letter "D" and fill the cup with soil from under a tree or bush in the Outdoor Classroom. (Not from a raised bed garden).

Part IV: Compare Soil Samples

- Review how to compare soil textures, and then ask the students to compare the texture between their four soil samples and record their observations on the Soil Comparison Charts (on Student Field Journal page 6.)
- Review how to compare soil colors, and then ask the students to compare the color between their four soil samples and record their observations on the Soil Charts.
- Review how to test soil's capacity to retain water, and then ask the students to compare the capacity to retain water between their four soil samples and record their observations on the Soil Charts.
- Review how different soil types have different abilities to support plant growth, and then ask the students to compare their four soil samples using the General Observations Approach or Extended-time Activity below. Then they record their observation on the Soil Charts.



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Teacher Tips (page 3 of 3)

Ability of Soil to Support Plant Growth: General Observation Approach

- Students should visit the areas where they collected their samples to examine the biodiversity and health of the plants in each area, and then record their observations in the Soil Chart.

Ability of Soil to Support Plant Growth: Extended-time Activity

- Students should plant a seed in each of the four remaining soil samples and record the time needed for the seed to sprout in their Soil Charts. Continue experiment until all seeds have the opportunity to sprout. Be sure to give all of the soil samples the same amount of light and water each day, so that the only variable being tested is the soil type.

Part V: Extension Activity

- Invite a guest speaker from your county's Soil and Water Conservation District Office to discuss the types of soil found in your county, to review the history of soil and water conservation efforts in your county, and to help your school collect a core sample from your schoolyard and/or outdoor classroom site.

Mini-lab Idea:

- Place approximately 1/3 cup of soil into a recycled plastic bottle. Add 1 cup of water. Place the top on the bottle and shake well. Let the soil settle. Notice the organic material that floats and the minerals that sink.

Tech Timeout: Create a time lapse video of the growth of your plants.



Alabama Course of Study Objective Correlations for 4th Grade

Language Arts: 28.) Conduct short research projects that build knowledge through investigation of different aspects of a topic. [W.4.7]

Science: 13.) Plan and carry out investigations to examine properties of soils and soil types (e.g., color, texture, capacity to retain water, ability to support growth of plants).

