

### **3.C.8 Soil Composition**

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*An interactive introduction to the composition of soil*

<b>Grade Level</b>	3
<b>Sessions</b>	(1): 1 at 40-60 minutes
<b>Seasonality</b>	None
<b>Instructional Mode(s)</b>	Whole Class, Small Groups
<b>Team Size</b>	4 students
<b>WPS Benchmarks</b>	03.SC.TE.05, 03.SC.IS.01, 03.SC.IS.04, 03.ES.SC.09
<b>MA Frameworks</b>	3-5.ES.0.4
<b>Key Words</b>	Igneous, Metamorphic, Rocks, Sedimentary

### **Summary**

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The objective of this lesson is to extend students' understanding of the composition of soil with a hands-on activity. Students will examine a variety of soil samples with a hand lens and will then create their own soil mixtures of organic and inorganic materials.

### **Learning Objectives**

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*2002 Worcester Public Schools (WPS) Benchmarks for Grade 3*

1. 03.SC.TE.05 Develop a knowledge and understanding of the metric measurement system.
2. 03.SC.ES.09 Observe sand with a hand lens. Note how particles resemble minerals. Observe topsoil with a hand lens. Look for fragments of organisms. Note differences in color, texture, odor, and clumping due to organic components vs. pure sand. Mix topsoil and sand together in various proportions to represent samples of types of soils.
3. 03.SC.IS.01 Ask questions and make predictions that can be tested.
4. 03.SC.IS.04 Conduct multiple trials to test a prediction. Compare the results of an investigation or experiment with the prediction.

*2001 Massachusetts Frameworks for Grade 3*

1. 3-5.ES.0.4 Explain and give examples of the ways in which soil is formed (the weathering of rock by water and wind and from decomposition of plant and animal remains).

### **Additional Learning Objectives**

1. Students will gain experience with the metric system.
2. Students will learn about the composition of soil as background for studying plants and plant growth.

### **Required Background Knowledge**

None

### **Essential Questions**

1. What types of materials comprise soil?
2. How do various mixtures of soil and sand appear?

### **Introduction / Motivation**

Explain to students that they will examine various types of soil and will then create their own soil. The instructor may wish to open the discussion by asking students what they already know about different kinds of soil, and if applicable, what they remember from the lesson 3.C.7 Soil – Water Retention.

### **Procedure**

The instructor will:

1. Create groups of students with approximately four children in each.
2. Provide students with four different samples of sand and soil (see Materials List). Assign a number to each sample so students can identify them on their worksheets (see Appendix A: Teachers Notes)
3. Ask students to spread a small amount of one soil sample on a large piece of paper and to separate the various components with a toothpick.
4. Ask students to observe each soil sample with a magnifying glass and to record the sample's properties on the worksheet titled Soil Explorer: Part 1.
5. Provide students with samples of topsoil and sand and ask them to mix the two according to the direction on the second worksheet (see Soil Explorer: Part 2).
6. Lead students through the worksheet, Soil Explorer: Part 2.

## **Materials List**

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<b>Materials per Class</b>	<b>Amount</b>	<b>Location</b>
Various Samples of Soil (ex. sandy, silty, loam, clay)	One cup of each soil type per group	Backyard, garden shop

<b>Materials per Student</b>	<b>Amount</b>	<b>Location</b>
<u>Soil Explorer: Part 1</u> Worksheet	One	End of lesson plan – print or photocopy
<u>Soil Explorer: Part 2</u> Worksheet	One	End of lesson plan – print or photocopy
White Construction Paper	One sheet	Classroom
Magnifying Glass	One	Classroom, science supply store
Toothpicks	Two	End of lesson plan – print or photocopy

## **Vocabulary with Definitions**

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1. *Clay* – a fine grain soil that is pliable when moist but hardens as it is heated.
2. *Compost* – decomposed organic material.
3. *Loam* – a soil containing clay, sand, silt and organic matter.
4. *Metric System* – a system of measurement based on powers of ten.
5. *Sand* – loose particles of broken rock.
6. *Silt* – particles of rock slightly larger than clay but smaller than sand.
7. *Soil* – a mixture of minerals, organic material, and decaying life forms.
8. *Topsoil* – the upper layer of soil; plant roots are typically found here.

## **Assessment / Evaluation of Students**

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The instructor may assess the students in any/all of the following manners:

1. Observe student groups at work to determine whether students understand that a mixture of sand and organic material make up soil.
2. Collect student worksheets and assess student understanding of the metric system.

### **Lesson Extensions**

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1. Allow students to use various-sized screens to separate the pieces of dirt and rock in their soil samples.

### **Attachments**

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1. [Appendix A: Teachers Notes](#)
2. [Soil Explorer: Part 1](#)
3. [Soil Explorer: Part 2](#)

### **Troubleshooting Tips**

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1. In preparing for the lesson, ensure that selected soil samples have plenty of organic material for students to observe. Add leaves, sticks or other organic materials as necessary to supplement soils and to enrich the students' investigation.

### **Safety Issues**

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None

### **Additional Resources**

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None

## **Appendix A: Teacher's Notes**

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With respect to the soil samples used in this lesson, a good variety of samples is recommended. Select mixtures such as: sand, silt, loam, peat, topsoil, and soil from various locations (backyard, park, etc.). Soils from different locations will allow students to see some of the many different kinds of soil on Earth.

Provide each student or group of students with four samples of various types of soil. Large plastic cups work well for passing these samples to students. The cups can be reused for the different soil types and for mixing the sand and dirt together. Allowing students to mix their own soil shows them how soil forms naturally, as well as its composition.

Emphasize the importance of the metric system and ensure that students are aware of the units they are using to describe the different amounts of dirt.

## Soil Explorer: Part 1

Name \_\_\_\_\_

Date \_\_\_\_\_

**Directions:** Pretend that you are a civil engineer who is studying the soil found at a construction site. Look at the four different soil samples that you have been given. **Observe** the different properties of your soil sample. Next, **observe** the different materials and organisms in the sample.

Soil Sample: number \_\_\_\_\_

This soil looks...

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Are there any minerals in this soil? Is it sandy?

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Are there any decaying (rotting) organisms, such as plants or insects, in this soil?

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Soil Sample: number \_\_\_\_\_

This soil looks...

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Are there any minerals in this soil? Is it sandy?

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Are there any decaying (rotting) organisms, such as plants or insects, in this soil?

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Soil Sample: number

This soil looks...

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Are there any minerals in this soil? Is it sandy?

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Are there any decaying (rotting) organisms, such as plants or insects, in this soil?

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Soil Sample: number

This soil looks...

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Are there any minerals in this soil? Is it sandy?

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Are there any decaying (rotting) organisms, such as plants or insects, in this soil?

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## Soil Explorer: Part 2

Name \_\_\_\_\_

Date \_\_\_\_\_

**Directions:** Pretend that you are a civil engineer who wants to create three different types of soil. Use a measuring cup marked with **milliliters** and mix different amounts of soil and sand. **Record** the different properties of your new mixtures, and record the different materials and organisms you find.

### Part One

Make a mixture of:

- 40 milliliters (ml) of sand
- 10 milliliters (ml) of topsoil

What does this soil look like?

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Is the soil very rough or smooth?

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Where do you think you might find soil like this outdoors?

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Part Two

Make a mixture of:

- 30 milliliters (ml) of sand
- 20 milliliters (ml) of topsoil

What does this soil look like?

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Is the soil very rough or smooth?

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Where do you think you would find soil like this?

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Part Three

Make a mixture of:

- 20 milliliters (ml) of sand
- 20 milliliters (ml) of topsoil

What does this soil look like?

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Is the soil very rough or smooth?

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Where do you think you would find soil like this?

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