

## Science Concept:

Soils have different properties.

## Objectives:

The student will:

- make observations and inferences about the physical properties of soil;
- communicate their inferences and observations about the physical properties (size, shape, texture, color, consistency, capacity to hold water) of a soil sample in a poem or song; and
- communicate information using several clear phrases or sentences that express concise meaning and thought.

## GLEs Addressed:

### Science

- [3] SB1.1 The student demonstrates an understanding of the structure and properties of matter by being able to classify matter according to physical properties (i.e., color, size, shape, weight, texture, flexibility).
- [3] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.

### Writing

- [3] W1.2.2 The student writes for a variety of purposes and audiences by using expressive language when responding to literature or producing text e.g. journals, pictures supported by text or poetry.

## Vocabulary:

*capacity* – the largest amount or number that can be contained (a jug with a capacity of four liters; the auditorium was filled to capacity)

*clay* – an earthy material that is sticky and easily molded when wet and hard when baked

*consistency* – the degree of thickness, firmness, or stickiness (dough of the right consistency)

*particle* – the smallest possible portion

*property* – a special quality of something (sweetness is a property of sugar)

*sand* – loose material in grains produced by the natural breaking up of rocks

*silt* – very small particles left as sediment from water; also : a soil made up mostly of silt with little clay

*soil* – the loose surface material of the earth in which plants grow

*texture* – the structure, feel, and appearance of something, such as a fabric (the smooth texture of silk)

## Materials:

- \*Silt
- \*Clay
- \*Sand
- Rulers (one per group)
- Magnifying glasses (one per group)
- 2-liter plastic bottles (one per group)
- Small cups, 6-8 ounces (two per pair of students)
- 16 ounce cups (three per pair of students)
- Soil samples from home/playground
- 1-liter plastic bottles (one per group)

- Eyedroppers (one per group)
- Water
- Graduated cylinders, 25 to 50-milliliters (one per group)
- Paper plates (several per group)
- Various kinds of M&M's (plain, peanut, almond, peanut butter, etc.)

\* Different soil samples can be used as long as they each have different properties.

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**Teacher's Note:** Be sure to observe all safety laws and procedures, including those pertaining to the use of food in the classroom or laboratory. Also, be careful when using non-commercial soil samples as soil may be contaminated.

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## Optional References

Tomeck, S. (2006). *Soda Bottle Science*. Scholastic Inc., pp. 41–42.

## Activity Preparation:

1. Remove the top from each 1-liter soda bottle to create a cylinder approximately 15 centimeters tall. Poke 8 to 10 holes in the bottom of each cylinder.
2. Cut 2-liter soda bottles in half and discard the bottom half.
3. Divide M&Ms into small cups (one per group) so that each cup contains a variety of M&Ms.

## Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

### Gear Up

#### **Process Skills: observing, classifying, describing, and communicating**

1. Divide students into pairs or groups. Distribute a small cup full of M&M's to each group.
2. Explain that students should not eat the M&Ms. (NOTE: Teachers may wish to allow students to eat some or all of the M&Ms after the lesson or at another time. The candies can also be used in art projects or kept for future sorting.)
3. Ask groups to pick one M&M from the cup and describe it by its size, shape, color and texture. Ask groups to pick out a second M&M, describe it, and compare it to the first. When the students seem to have an idea of what properties are have them sort and classify all their M&M's in as many ways as they can. As a class, discuss the properties that groups used to place the M&M's into categories.

### Explore

#### **Process Skills: observing, describing, communicating, and inferring**

4. Distribute samples of silt, sand, and clay, a paper plate, a magnifying glass, an eyedropper, and a cup of water to each group of students.
5. Instruct students to rub each soil sample between their thumb and forefinger. As a class, describe how each sample feels, and how the samples compare in texture.
6. Ask groups to look at each soil sample under a magnifying glass, then discuss, describe, and compare the particle sizes and the consistency of each sample.
7. Instruct groups to use an eyedropper to add water to a small amount of each sample until it sticks together. Instruct groups to discuss, describe, and compare how each sample feels and how well it sticks together and holds its shape.
8. Divide students into pairs and distribute a 1-liter soda bottle cylinder, ruler, soda bottle funnel (top half of 2-liter bottle), 3 large (16 oz) cups, one small (6 or 8 oz.) cup, graduated cylinder, and soil samples to each pair.

9. Guide groups through the following procedure:
  - STEP 1. Mark the cylinder with a line 10 centimeters from the bottom.
  - STEP 2. Fill the cylinder with sand up to the mark.
  - STEP 3. Place the cylinder with the sand into the funnel. Set the funnel on top of a large (16 oz.) cup.
  - STEP 4. Fill the small (6 to 8 oz.) cup with water and pour it steadily into the sandy sample.
  - STEP 5. Allow the water to drain through the soil and into the bottom cup.
  - STEP 6. Remove the large (16 oz.) cup and label it "sandy." (NOTE: Tape can be written on and placed on the cups for ease of labeling.)
  - STEP 7. Empty the cylinder and rinse and dry both the cylinder and the funnel.
  - STEP 8. Repeat steps 3 -7 for silt and clay.
  - STEP 9. Use a graduated cylinder to measure and compare the water level in the three cups.



## Generalize

**Process Skills:** *making generalizations, describing, communicating, inferring, and classifying*

10. As a class, discuss the following:
  - a. What differences were there in the soil samples?
  - b. What characteristics or properties does each soil sample have?
  - c. In what ways can the samples be sorted?
  - d. Which soil has the largest particles?
  - e. What differences did you notice in how each type of soil holds water?
  - f. How might the properties of a soil affect plant growth?
  - g. How might the properties of a soil affect erosion?

## Apply

**Process Skills:** *communicating, inferring, making generalizations, describing, and classifying*

11. Ask students to acquire a sample of soil from home or school property, then write a poem or song to describe the properties of the soil. The song or poem should include at least three of the following properties: particle size, particle shape, texture, color, consistency, or capacity to hold water. (NOTE: Alternatively, students can write a descriptive paragraph.)
12. Ask students to imagine they are planting flowers around their houses. Ask them to describe the type of soil they would use, and explain why they would choose that type of soil.

## Assessment Task

Using a soil sample from home, observe and describe its properties in a song or poem. Include in the song or poem a description of at least three of the following properties: size, shape, texture, color, consistency, or capacity to hold water.

## Rubric

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student describes the properties of a soil sample.	[3] SB1.1	The student describes fewer than three properties of a soil sample.	The student describes three properties of a soil sample.	The student describes more than three properties of a soil sample.
The student makes observations, inferences and communicates those observations.	[3] SA1.1	The student does not, or incorrectly, states his or her own observations and inferences in a poem or song.	The student states one observation and inference in a poem or song.	The student states two or more of his or her own observations and inferences in a poem or song.
The student writes a poem or song.	[3] W1.2.2	The student uses one or two phrases that are unclear in meaning to write a poem or song.	The student uses two clear phrases or sentences that express concise meaning and thought to write a poem or song.	The student uses three or more clear phrases or sentences that express concise meaning and thought to write a poem or song.