Background

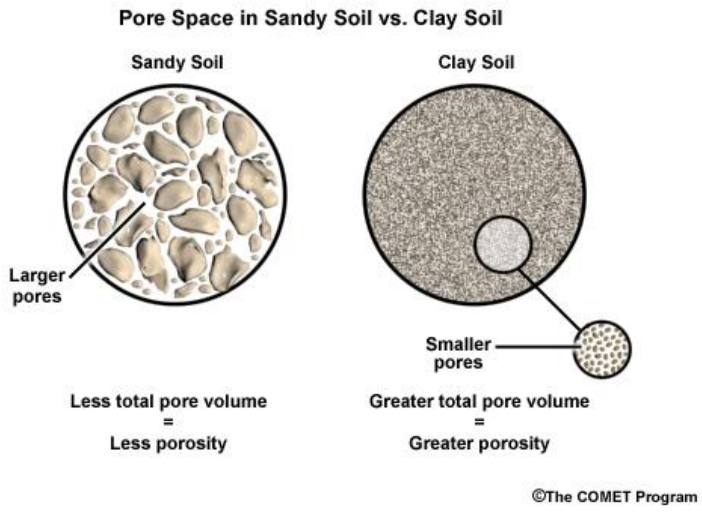
As you discovered in the Soil Texture Investigation, the texture of soil reflects the amount of sand, clay, and silt in that soil. Recall that sand has relatively large particles and that clay has miniscule ones. These minerals also have spaces between their particles, called *pores*. Smaller minerals fit more closely together and so have smaller pores. The soil's composition and its *porosity* (the volume of pores in the soil) influence the ability of water to infiltrate and *percolate* (pass down) through the soil. Interestingly, porosity also affects the soil's capacity to store, or retain, water.

In this activity, you will investigate the percolation rates of sand and clay, as well as soil samples from your school grounds.

Definition

Loam is soil that consists of about equal parts sand and silt and a smaller portion of clay. Loam also usually includes *organic matter* (decomposed plants, animals, bacteria, and fungi). The composition of loam enables it to retain nutrients and water, while also allowing the percolation of water. These features make loam excellent for gardening and reducing erosion and stormwater runoff.

Is your school soil loam?



Materials

- ___ Water
- ___ 1 Timer
- ___ 1 Measuring cup or beaker
- ___ 1 clear 2-liter bottle top for **each** soil sample
- ___ 1 clear 2-liter bottle bottom or similar container for **each** soil sample
- ___ 1 piece of window screen for **each** soil sample
- ___ 500 mL of each soil sample: sand, clay, loam, school soil
- ___ Extra containers to place wet bottle tops containing wet soil samples
- ___ Containers or buckets to place wet soil samples to be dried and stored for future use

Pre-Lab

Predict water percolation by answering the **A**-lettered questions in the **Percolation Test Chart**.

Lab Procedure

Before starting, read the entire procedure.
Assign each group member a job: Reader, Timer, Measurer, Pourer, Data Recorder.

1. Balance the top half of the 2-liter bottle upside down in the bottle's bottom half. Center the window screen in the top part; press the screen down inside the bottle to cover the opening.

2. While holding the screen in place, pour 500 mL of soil into the top.
   **Clay can be approximated and needs to be placed so that it leaves no gaps along the bottle sides.*

3. Fill the measuring cup with 500 mL of water.

4. Start the timer and begin to pour the water at the same time.

5. When the water first drips into the bottom of the bottle, record the time on the **Data Table**.
   DO NOT stop the timer.

6. After 4 minutes, remove the top bottle half. Measure how much water is in the bottom.
   Record this amount on the **Data Table**.

7. Answer all of the **B**-lettered questions in the **Percolation Test Chart** for that soil sample.

8. Repeat steps 1-7 with your other soil samples, if applicable.

9. Use the class data to answer the **Post-Lab Discussion Questions**.

Percolation Test Chart

A. Prediction B. Observation	Sand	Clay	Loam	School Soil	Explanation
1A. Will the water run out through the bottom of the bottle?					
1B. Did the water run out of the bottom of the bottle?					
2A. How many ml of water will run out?					
2B. How many ml of water percolated through?					
3A. How many seconds will it take for the water to pass through the soil?					
3B. The time it took for the water to percolate:					
4A. What will the water look like when it comes through?					
4B. What does the water look like?					

Class Data Table

	Sand		Clay		Loam		School Soil	
	Amount percolated after 4 min. (mL)	Time for water to percolate (sec.)	Amount percolated after 4 min. (mL)	Time for water to percolate (sec.)	Amount percolated after 4 min. (mL)	Time for water to percolate (sec.)	Amount percolated after 4 min. (mL)	Time for water to percolate (sec.)
Team 1								
Team 2								
Team 3								
Team 4								
Team 5								
Team 6								
Average								
Average Rate mL/sec								

Post-Lab: Discussion Questions

1. Which soil had the most water percolate after 4 minutes?

2. Which had the least?

3. Which soil had the fastest percolation rate?

4. Which had the slowest?

5. EXTRA CREDIT CHALLENGE: Rain gardens reduce water pollution by catching stormwater runoff so that it is used by the garden plants and slowly filter through the garden soil. From these results, how would a rain garden function if it were mostly sand? How would it function if it was mostly clay? What if there was a layer of clay under loam? How could you test your answer to this last question?