Density and Texture of Soil

The purpose of this lab is to demonstrate the difference in soil texture and how this difference relates to soil density. Differences in the proportion of soil components are what determines soil texture, which also affect soil properties. Students will also understand other factors such as compaction that affect soil density.

Primary Learning Outcomes
What is soil texture? What is soil density?

Assessed Georgia Performance Standards:

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SCSh6. Students will communicate scientific investigations and information clearly.

SCSh7. Students will analyze how scientific knowledge is developed.

SCSh8. Students will understand important features of the process of scientific inquiry.

SPS5. Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

SPS6. Students will investigate the properties of solutions.

Procedures/Activities
Step1: Duration: 1 hour 30 minutes
Students will go out into schoolyard and collect representative soil samples from across school campus. Students will measure and record initial mass of soil sample prior to drying. Samples will then be placed in the oven in disposable aluminum pie pans to dry to obtain dry mass. (Note: Samples dry better if they are broken up into smaller pieces prior to drying. Samples should be dried for a total of about 8 – 10 hrs at about 225 degrees F. This drying time can be broken up into smaller segments to accommodate time in which the oven can be monitored. If this is done, drying time will need to be on the upper end of the above mentioned range.) Mass of the dried

sample, along with the volume of the soil sampler will then be used to calculate bulk density of each soil sample.

Step 2: Duration: 1 hour 30 minutes
Students will add soil samples with varying textures to a mason jar along with a dispersal agent (Calgon) in a suspension of water. Students will then measure the amount of soil that settles out of the suspension at 15 minutes, 1 hour, and 24 hours to estimate the amount of sand, silt, and clay associated with each soil sample. Students will then use the percentages of each particle along with a textural triangle to determine each soil type.

Materials and Equipment

1. Soil Probes
2. Oven to dry soil samples
3. Calculator to calculate soil density.
4. Mason jar
5. Dispersal agent such as Calgon
6. Balance scales
7. Miniature pie plates to dry soil samples.
8. Soils of varying textures.

Total Duration

3 hours

Assessment

Students will be assessed according to their participation in the lab exercise. A lab report must be turned in by each lab group documenting their work on both activities. Students will also be evaluated on their proper use of laboratory procedures and safety measures.

Bulk Density Data Table

Volume of Soil Probe	*Wet Mass of Soil*	*Wet Density of Soil*	*Dry Mass of Soil*	*Bulk Density of Soil*

Soil Texture Data Table

	Measurement 1	*Measurement 2*	*Measurement 3*	*Average*
15 minutes (Sand)				
1 hour (Sand/Silt)				
24 hours (Sand/Silt/Clay)				

Soil Texture Calculations

Note: Use the average values calculated in the above data table for calculations in the table below.

Amount of Sand
(15 min) _____

Percent Sand
(Sand Amt / 24 hr) * 100 _____

Amount of Silt
(1hr minus 15 min) _____

Percent Silt
(Silt Amt / 24 hr) * 100 _____

Amount of Clay
(24 hrs minus 1 hr) _____

Percent Clay
(Clay Amt / 24 hr) * 100 _____

Soil Texture (From Textural Triangle): _____

Soil Textural Triangle