

ENVIRONMENTAL ENCOUNTERS

Lesson Plans for the Science of Water



Water Holding Capacity of Soils

Suggested grade level:

Fourth grade

Objective:

Students will set-up an experiment to measure the amount of water retained in four soil materials. They will use the scientific method to record and evaluate their findings.

Curriculum ties:

- √ Fourth grade Science Standard 3 Objective 3 a-e
- √ Science Process Standard 1 a-h
- √ Fourth grade Math Standards 4-1a-b and 5-1 a-c
- √ Visual Fine Arts Standard 2 (Perceiving) Objective 2 a-e, Standard 3 (Expressing) Objective 2 c-d

Time needed:

- √ Prep: 1-2 hours
- √ Pre trip: 2-3 hours
- √ Garden: 1-2 hours
- √ Post trip: 1 hour

Materials needed:

- √ Four clear plastic cups for each student or group
- √ Water
- √ Pea gravel, sand, and potting mix (organic mix)
- √ 1/3 c. and 1 c. measuring cups
- √ Scale (one is fine to share, but two or three are better)
- √ Paper and writing utensils for writing or drawing observations and recording data

Teacher notes:

In this activity students will learn about the water holding capacity of different materials in the soil. Components are measured dry, then allowed to sit overnight. They are then drained for 15 minutes and measured wet. Gravel, sand and organic materials all retain the water with which each particle is coated.

Sand and organic materials retain water in the air space between particles. In addition, organic materials absorb water into the interior of dead cell material. Students use the scientific method to first create a question, then a hypothesis, then experiment to evaluate the hypothesis, and finally analyze data to create conclusions.

Procedures:

Preparation

Call 801-565-4314 to schedule your visit to the Conservation Garden Park at Jordan Valley.

In the classroom

For each group of students:

1. Measure 1 c. gravel into cup #1
2. Measure 1 c. sand into cup #2
3. Measure 1 c. organic material into cup #3
4. Measure 1/3 c. of each into cup #4
5. Weigh each of the above samples. Record your data.
6. Add 1 c. water to each cup.
7. Weigh each of the samples with water added. Record your data.
8. Let samples sit over night.
9. Tip samples on their sides to drain water. Do not allow materials in cup to drain out with water. Drain all samples for 15 minutes.
10. Weigh each of the samples after the water is drained. Record your data.
11. Calculate difference between drained weight and dry weight to find how much water is retained. (Difference is a subtraction problem.)
12. Create a graph to display your data. Write a summary to explain your results.

Field trip

At the Conservation Garden Park, a guide will explain the different soils throughout the Garden. Describe how much organic and inorganic material is in each soil type. At the “Signature Soils” exhibit, students can observe the three primary soil types: sand, silt and clay. A Garden guide will explain how the soils are prepared with amendments to help improve their structure.

Follow up

- √ Have students look at the soil in their own yard and see how it is divided between organic and inorganic materials. Predict the water holding capacity of the soil in your own yard.
- √ Have students work as a class to design a science fair sample display using this experiment. Be sure to include question, hypothesis, experimental procedure, data analysis and conclusions.

Assessment:

Student graphs and summary reports should show that sand holds more water than gravel, and that organic holds more than sand. The mixed sample (#4) will vary based on which layer is organic. If on the bottom layer, sand and gravel will compress the organic layer, allowing less water to be absorbed. If in the middle layer, it will absorb well and will be held in place. On top, it tends to float and does not always absorb as well.