Grade Level:
9th Grade

Subject:
Physics and Chemistry

Exhibit:
#13 Demand Management
(Soil Moisture Capacity)

Approximate Time Frame:
2 hours *(more than one class period)*

Materials:
- paper
- pencil
- filter paper
- soil
- organic matter
- funnel
- scale
- small beaker

Lesson Plan - Totally Soiled

Science TEKS:

1. A Demonstrate safe practices during field and laboratory investigations.
1. B Make wise choices in the use and conservation of resources and the disposal or recycling of materials.
2. A Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
2. B Collect data and make measurements with precision.
2. C Organize, analyze, evaluate, make inferences, and predict trends from data.
2. D Communicate valid conclusions.
3. A Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information.
3. B Draw inferences based on data related to promotional materials for products and services.
3. C Evaluate the impact of research on scientific thought, society, and the environment.
3. D Describe connections between physics and chemistry, and future careers.
3. E Research and describe the history of physics, chemistry, and contributions of scientists.

Related TEKS: Environmental Science, Biology

Vocabulary of Instruction:
soil compositions organic matter

Advanced Preparation:
Organize students' into groups

Instructional Procedure (5 E)

Engage: The students will prioritize water use by importance at an individual level, agricultural level and industrial level. Incorporate alternatives to water use. Design and complete a variety of lab exercises to help understand sources of water, water scarcity, and water conservation.

Explore: Weigh and record the weight of each soil sample. Make sure the samples are small enough to fit into a funnel with some filter paper. Soak the filter paper and weigh it also so that you can subtract this weight from the final saturated soil and filter paper weight.

Fold the filter paper and put it into a funnel. Place the funnel set up so that it stands up in a small beaker. Make three of these setups.

Transfer the soil into the funnels with the filter paper and use a water bottle to thoroughly soak the soil. Be careful here that you soak the soil all the way through by stirring it up a little. Do not lose any of the soil while stirring.

Let the system drip until it stops losing water. At this point the soil has reached its maximum saturation and is holding as much water as it can.

Remove the filter and saturated soil to weigh the two. Subtract the weight of what the dry soil was and the weight of the wet filter paper to get the weight of the water being held.

Calculate the soil moisture capacity by dividing the mass of water by the mass of the dry soil and multiplying by 100. This answer will tell you what percent of the soils weight in water the soil can hold.

Next predict what type of soil mixture will create the best type of soil that you have researched for a particular garden plant you have chosen. An example would be 30% sand, 50% clay, and 20% mulch. Mix your soil and determine its soil moisture capacity.

Explain: Different soil compositions can hold different amounts of water for the same mass of soil. Clay, loam, and sandy soils each have their own soil moisture capacities and combining these types of soil can create the perfect soil for the type of plants you are growing. Soil that has good drainage, organic matter, and are mineral rich, and aeration are carefully mixed for different agricultural situations. In this lab you will determine the soil moisture capacity of the three types of soils (sand, clay, and mulch) and then predict which type of mixture percentage will create the best soil for garden planting.

Elaborate/Extend:
Questions:
How does soil composition determine the types of plants that can live in that soil?
How could a soil that holds too much water effect a plant?
How about too little water?
How would soil composition effect how fast water soaks into the ground after a rainstorm?

How would soil composition effect how fast **water soaks** into the ground after a rainstorm?

Well aerated soil is good for plants but how will that effect desiccation of the soil?

Evaluate: Closure of class will consist of student groups developing and presenting a statement about what they learned today and how it may change their ideas toward their water use and other water usage in the city.