Lesson Title	Science with Mud!
Length of Lesson	45 - 60 minutes
Created By	Lucas Pounders
Subject	Ecology, Chemistry
Grade Level	8th Grade
State Standards	Eighth Grade - 4a
DOK Level	1
DOK Application	Who, What , When , Where, Why, Connect
National Standards	5 - 8 - Science as Inquiry
Graduate Research Element	Soil Moisture Chemical Reactions

Student Learning Goal:
This lesson is designed to improve students understanding of ecology and the scientific method from the viewpoint of a chemist and ecologist. It relates the idea of soil moisture with chemical bonding and ecological habitat conservation.

State Standards

1. Draw conclusions from scientific investigations including controlled experiments.

a. Design, conduct, and analyze conclusions from an investigation that includes using experimental controls.

d. Analyze evidence that is used to form explanations and draw conclusions.

e. Develop a logical argument defending conclusions of an experimental method.

h. Analyze different ideas and recognize the skepticism of others as part of the scientific process in considering alternative conclusions.

National Standards
LEVELS 5-8

Abilities necessary to do scientific inquiry

Understanding about scientific inquiry

Materials Needed (supplies, hand-outs, resources):
Powerpoint Presentation on Soil Moisture and Scientific Method
Handouts for students
- Scientific Method
- Instructions on lab technique

Four types of soil – Sand, Topsoil, Potting Soil, Clay
Bunsen Burner or other heating element
Flame striker or Match
Ring Stand and Wire Gauze
Crucible
Measuring cup

4 - Filter papers or cheese cloth per group
1 - Tray to catch water per group
1 – Strainer or funnel per group

Lesson Performance Task/Assessment:
Precede this lesson with a starter lesson on ecology, chemistry, the scientific method or all three. Start the lesson by introducing the students to the concept of the lab through a powerpoint presentation. The presentation should cover The ideas of soil moisture, simple chemical bonding and how the two relate to many jobs found in forestry, fire management, ecology, chemistry, hydrology, etc. Follow this with the introduction of the lab itself. First and foremost lab safety is a must. This should always be the first topic introduced and reiterated at the beginning of any lab no matter how minor. Next introduce the lab equipment. At this point to capture the interest of the students a little more you will perform a demonstration of how to calculate soil moisture using the Bunsen burner.

Prior to the class showing up you are to measure one cup of soil and have your ring stand, wire gauze, crucible and Bunsen burner set up for use.

Take the "dry" soil sample and weigh it on a scale inside of a previously weighed container.

After weighing the soil sample place the soil sample in the crucible, onto the wire gauze and heat with the Bunsen burner for five minutes with a blue flame.

Pull the soil sample from the burner and weigh it again after cooling in the same previously measured container.

The difference in the weight is the weight that the soil sample held. This is to let the students understand that healthy soil normally holds a certain amount of water. Next you are then to perform the task of demonstrating what the students will be doing in the lab themselves.

Measure the measuring cup by itself. (This is part of your control.)

Record the measurement.

Measure the measuring cup filled with the soil sample.

Record the measurement.

Place one filter paper in the bottom of the strainer.

Pour the one cup of soil on top of the filter paper.

Hold the strainer over a sink or tray to catch the water.

Slowly pour approximately 600mL of water over the sample in order to saturate the entire sample. (This is the second part of your control.)

- The pouring should take approximately 40 seconds and cover the entire sample.

Allow the sample to drip for 1 minute. (This is the third part of your control.)

Next place the soil back into the previously measured container and weigh one final time.

Record the measurement.

The students are to complete this task one time through for each soil type supplied. The parts that are outlined as a control are very important to keep constant across all four soils in the lab. Make the clay sample the last sample to be used as it will hold water for a much longer time it will most likely not saturate any water that is poured on it. After completing the physical part of the lab the students will then go on to find out the amount of water that was held in the soil and discuss their findings.

Lesson Relevance to Performance Task and Students:
The relevance to students comes when they realize that something as simple as water bonding to soil is a type of chemical reaction. This should open conversation to see what else the students can come up with from their daily lives that is a chemical reaction.

Anticipatory Set/Capture Interest:
The anticipatory set for this lesson is in the demonstrations themselves. The students should be interested in finding out what exactly they are going to be finding out. Also, fire in labs is almost always an added attraction.

Guided Practice:
After the powerpoint presentation and demonstrations the students will participate in the physical and discussion parts of the lab. Teacher assistance will be issued as needed.

Independent Practice:
Students will fill out a handout that outlines the scientific method as they have applied it to the task at hand.

Remediation and/or Enrichment:
Follow student IEP.

Check(s) for Understanding:

Which soil held the most moisture?
Why did that soil hold more moisture than the others?
Which soil held the least?
Why did that soil hold the least?
What else could have been measured?
Where there any issues and how do you think it affected your measurements?
How did you overcome these issues?

Closure:
Closure comes in the form of class discussion where the students will ask questions about their lab. Groups will be able to interject ideas that they have about issues that the other groups encountered in the lab.

Possible Alternate Subject Integrations:
General Science, Botany, Ecology, Mathematics

Teacher Notes:
Always be sure to know the material that you are presenting and make a dry run through your lectures and labs before trying to attempt them in class. Do not be afraid to substitute and improvise as needed.