Class Question:

What variables affect how much liquid a soil can absorb?
VOCABULARY

Science: The study of the material world using human reason. The scientific method is the way humans reason and apply logic to data to help gain knowledge of the world.

- **Observation**: A description using your five senses. This could include contents, mass, size, color, temperature, smell, texture ...
- **Opinion**: Something you believe or feel. Not a fact or observation.
- **Inference**: A guess based on past experiences.
- **Experimental Set-Up**: The materials, changing variable, and controls that are needed for an experiment.
- **Experiment**: A test or trial to discover something unknown.
- **Procedure**: A set of steps to conduct an experiment.
- **Controls**: The variables that are not changed in an experiment.
- **Changing Variable (Independent Variable)**: The variable that is purposely changed in an experiment.
- **Results/Data (Dependent Variable)**: The measurements/observations of the experiment, which are influenced/determined by the changing variable.
- **Prediction**: What you expect to happen based off of previous measurements/observations.
- **Scientific Practices**: A series of activities that scientists participate in to both understand the world around them and to communicate their results with others. (The specific practice worked on in this module is observations.)
- **Technique**: A method for a specific task.
- **Absorb**: The ability to hold liquid.
- **Soil**: A top layer of earth.
- **Potting Soil**: A soil that contains a majority of dead plant materials with some rocks (sand) and no clay.
- **Sand**: A soil that contains very small pieces of rocks.
- ** Vermiculite**: A soil that contains mica (a highly absorbent natural material).
- **Dropper**: A piece of laboratory equipment used to add liquids one drop at a time.
- **Graduated Cylinder**: A piece of laboratory equipment used to measure the volume of a liquid.
- **Milliliter (mL)**: A unit of volume used for liquids.
- **Subtraction**: The amount (difference) between two numbers.
- **Compact**: To put force on something to make it smaller.
- **Loose**: Not fit together tightly/closely.
- **Engineer**: A person that uses their understanding of science to design things that can solve problems.
- **Landslide**: When part of a mount of cliff falls down. This usually happens after rainstorms.
- **Slope**: A measure of the steepness of a line, hill, or other object
- **Soil Consistency**: The ability of soil to stick to itself.
Technique
Graduated Cylinders

Graduated cylinders are used to measure volumes of liquids.

How to read a graduated cylinder:
1. Put your finger on the bottom of the dip also known as the meniscus.
2. Move your finger down to the next labeled number.
3. Count up to the meniscus.
4. The final volume is the sum of the labeled number and the counted number.

How much water is in each graduated cylinder?

A  
B  
C  
D
Observation: A description using your ________________________________

Circle OBSERVATION if the statement is an observation you can make about the object. Circle NOT AN OBSERVATION if the statement is not an observation you can make about the object.

1. The object is lighter than a bowling ball. Observation Not an Observation
2. The object is only one color. Observation Not an Observation
3. The object is thicker than a broom handle. Observation Not an Observation
4. The object is silly. Observation Not an Observation
5. The object has lines. Observation Not an Observation
6. The object can be bent so both ends touch. Observation Not an Observation
7. The object came from the grocery store. Observation Not an Observation
First choose/circle the factor that you would like to experiment with. Then within that row, circle what you would like your changing variable to be. Finally, circle the measurement you will make.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Changing Variable</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Soil Amount</td>
<td>Liquid Amount (mL)</td>
</tr>
<tr>
<td></td>
<td>Soil Type</td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>Liquid Thickness</td>
<td>Liquid Amount (mL)</td>
</tr>
</tbody>
</table>

**QUESTION**

Question our group will investigate:

- If we change the ____________________, what will happen to the amount of liquid that the soil absorbs?

Fill out the materials page with your SciTrek volunteer before moving onto the experimental set-up.

**EXPERIMENTAL SET-UP**

**Changing Variable:** ____________________________________________________________

**Controls** (variables you will hold constant):
Write your controls and the value you will use in all your trials (control/value, Ex: container type/cup).

<table>
<thead>
<tr>
<th>Container Type / Cup</th>
<th>/</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>/</td>
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</tbody>
</table>
## PROCEDURE

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
RESULTS

Table

Fill out the chart for each of your trials. For the variables that remain constant, write the value in trial A and then draw an arrow through each box to indicate the variable is a control.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
<th>Trial E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Type:</td>
<td>Cup</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Type:</td>
<td></td>
<td></td>
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<tr>
<td>Soil Amount:</td>
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<td></td>
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<tr>
<td>Liquid Thickness:</td>
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<tr>
<td>Liquid Amount:</td>
<td></td>
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</tr>
</tbody>
</table>

Data

<table>
<thead>
<tr>
<th>Final Measurements/Observations:</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
<th>Trial E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Amounts (mL):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fill in the amount of liquid in the large cup and the amount of liquid absorbed by the soil.

Other:

The independent variable is the changing variable and the dependent variables are the final measurements/observations.
**RESULTS**

*Graph and Summary*

<table>
<thead>
<tr>
<th>Liquid Absorbed (mL)</th>
<th>100</th>
<th>90</th>
<th>80</th>
<th>70</th>
<th>60</th>
<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>0</th>
</tr>
</thead>
</table>

My experiment shows ____________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
I acted like a scientist when


TIE TO STANDARDS

1. Absorb: The ability to ____________________________ liquid.

2. 100 ml of water was poured over each cup, circle the soil that absorbed the most liquid.

A

B

3. The _______ the soil the more likely a landslide.

   Heavier

   Lighter

4. Read Finding 1 from the poster.
Possible Factor 1: Liquid Amount (for 1 small cup of potting soil)

5. Is there a limit to the amount of water that soil can absorb?

   YES          NO

6. 1 small cup of potting soil can hold ________________ of water.

7. How much water can 2 cups of soil absorb? _______________________

8. Adding water to soil makes the soil
   Heavier
   Lighter

9. The ___________ water in the soil the more likely a landslide.
   More
   Less

10. Read Finding 2 from the poster.
Possible Factor 2: Soil Type

11. Label the following soil types from least to most absorbent. Label the least absorbent soil as 1 and the most absorbent soil as 3.

______Small Rocks  ______Large Rocks  ______Sand

12. __________________________ affects how much water a soil type can absorb.

13. Sand holds _______ water than large rocks making wet sand _______ than wet large rocks which results in wet sand having _______ landslides than wet large rocks.

14. __________________________ affects how much water a soil type can absorb.

15. Vermiculite holds _______ water than sand making wet vermiculite _______ than wet sand, which results in wet vermiculite having _______ landslides than wet sand.

16. Read Finding 3 from the poster.
Other Possible Factors:

17. Another factor that affects landslides is the __________________ of the soil.

18. Draw a picture where a landslide is more and less likely to happen

![Landslide More Likely to Happen](image1)

Landslide More Likely to Happen

![Landslide Less Likely to Happen](image2)

Landslide Less Likely to Happen

19. The __________________________ the slope the more likely a landslide.

20. Read Finding 4 from the poster.


![Plant Prevention](image3)

22. Another factor that affects landslides is the ability of soil to __________________

23. The more plants the Greater the soil sticks to itself, the Greater the soil consistency and the More likely a landslide.

24. Read Finding 5 from the poster.
Possible Ways to Prevent Landslides

25. What factor does this address? ________________________________

26. What factor does this address? ________________________________
EXTRA PRACTICE
Observations

Observation: A description using your ________________

Circle OBSERVATION if the statement is an observation you can make about the picture. Circle NOT AN OBSERVATION if the statement is not an observation you can make about the picture.

1. The person is wearing a diving mask.
   Observation

2. The fish only have one fin each.
   Observation

3. The person is smaller than a fish.
   Observation

4. Snorkeling is fun.
   Observation

5. There are more fish than people.
   Observation

6. The person’s shorts are black.
   Observation

7. The person and fish are in the ocean.
   Observation
WORD SEARCH

Absorb  Landslide  Sand
Dropper  Milliliter  Science
Engineer  Observation  Soil
Experiment  Opinion  Subtraction
Inference  Procedure  Vermiculite
SciTrek is an educational outreach program that is dedicated to allowing 2nd-12th grade students to experience scientific practices first hand. SciTrek partners with local teachers to present student-centered inquiry-based modules that not only emphasize the process of science but also specific grade level NGSS performance expectations. Each module allows students to design, carry out, and present their experiments and findings.

For more information, please feel free to visit us on the web at http://www.chem.ucsb.edu/scitrek/ or contact us by e-mail at scitrekadmin@chem.ucsb.edu.

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