How Science Works

Grade 2

Module 1

Class Question:

What variables affect how much liquid a soil can absorb?

Scientist (Your Name): ________________________________

Teacher’s Name: ______________________________________

SciTrek Volunteer’s Name: ______________________________
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 changed in an experiment.
- **Dependent Variable**: The variable that is influenced/determined by the changing variable; the variable that is measured/observed.
- **Materials**: List of all supplies and equipment.
- **Prediction**: What you expect to happen based off of previous measurements/observations.
- **Results/Data**: The measurements/observations of the dependent variable. The recorded information from an experiment.
- **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 of mica (a highly absorbent natural material).
- **Dropper**: A piece of laboratory equipment used to add liquids one drop at a time.
- **Graduated Cylinder**: Piece of laboratory equipment used to measure the volume of a liquid.
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?*

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>88 mL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCIENTIFIC PRACTICES
Observations

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 Amount</td>
<td>Liquid Amount (mL)</td>
</tr>
<tr>
<td></td>
<td>Liquid Thickness</td>
<td></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?
  
  what you are measuring (dependent variable)

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):
Determine the variables that you will hold constant and indicate the specific value you will use in all your trials. (control/value, example: cup material/plastic)

Control/Value

<table>
<thead>
<tr>
<th>Cup Material</th>
<th>Plastic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE

1. ____________________________________________
   ____________________________________________
   ____________________________________________

2. ____________________________________________
   ____________________________________________
   ____________________________________________

3. ____________________________________________
   ____________________________________________
   ____________________________________________

4. ____________________________________________
   ____________________________________________
   ____________________________________________
Fill out the chart for each of your trials. For the variables remain constant, write the value in trial A and then draw a line through each box to indicate that this 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>Cup Material:</td>
<td>Plastic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Soil Type:                 |         |         |         |         |         |
| Soil Amount:               |         |         |         |         |         |
| Liquid Thickness:          |         |         |         |         |         |
| Liquid Amount:             |         |         |         |         |         |

<table>
<thead>
<tr>
<th>Data</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
<th>Trial E</th>
</tr>
</thead>
</table>

| Final Observation/Measurements: |         |         |         |         |         |
| Liquid Amounts (mL):           |         |         |         |         |         |

The independent variable is the changing variable and the dependent variables are the final observation/measurements.
My experiment shows

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

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I acted like a scientist when

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

TIE TO STANDARDS

1. Absorb: The ability to ____________________________ liquid.

2. Circle the soil that absorbed the most liquid.

3. The ____________________________ the soil the more likely a landslide.
Possible Factor 1: Liquid Amount (for 1 small cup of potting soil)

4. Is there a limit to the amount of water that soil can absorb?
   
   YES  
   NO

5. 1 small cup of potting soil can hold _________ of water.

6. How much water can 2 cups of soil absorb? ________________________________

7. Adding water to soil makes the soil ________________________________.

8. The ________________________________ water in the soil the more likely a landslide.
Possible Factor 2: Soil Type

9. 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

10. ______________________________ affects how much water a soil type can absorb.

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

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

13. Vermiculite holds _______ water than sand making wet vermiculite _______ than wet sand which results in wet vermiculite having _______ landslides than wet sand.
Other Possible Factors:

14. Another factor that affects landslides is the _________________ of the soil.

15. 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

16. The _________________ the slope the more likely a landslide.

17. Draw a picture of why plants help prevent landslides.

![Plant Diagram](image3)

18. Another factor that affects landslides is the ability of soil to _________________

<table>
<thead>
<tr>
<th>Greater</th>
<th>Greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaker</td>
<td>Weaker</td>
</tr>
<tr>
<td>More</td>
<td>More</td>
</tr>
<tr>
<td>Less</td>
<td>Less</td>
</tr>
</tbody>
</table>

19. The more plants the the soil sticks to itself, the the soil consistency and the likely a landslide.
Possible Ways to Prevent Landslides

What factor does this address?

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 Not an Observation
2. The fish only have one fin each. Observation Not an Observation
3. The person is smaller than a fish. Observation Not an Observation
4. Snorkeling is fun. Observation Not an Observation
5. There are more fish than people. Observation Not an Observation
6. The person’s shorts are black. Observation Not an Observation
7. The person and fish are in the ocean. Observation Not an Observation
SciTrek is an educational outreach program that is dedicated to allowing 2nd-8th grade students to experience the scientific process first hand. SciTrek partners with local schools to present student-centered inquiry-based modules that not only emphasize the process of science but also specific grade level content standards. Each module allows students to design, carryout, 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/](http://www.chem.ucsb.edu/scitrek/) or contact us by e-mail at scitrekadmin@chem.ucsb.edu.

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