How Science Works

Grade 2

Module 2

Class Question:

What variables affect plant growth?

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 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.
- Vermiculite: A soil that contains mica (a highly absorbent natural material).
- Nutrient: Something that can be added to the soil and/or the water to affect plant growth.
- 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.
- Ruler: Piece of laboratory equipment used to measure the length of an item.
- Millimeter (mm): A unit of length.
- Subtraction: The amount (difference) between two numbers.
SCIENTIFIC PRACTICE

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 smaller than a jump rope. Observation Not an Observation
2. The object is made out of metal. Observation Not an Observation
3. The object is hotter than boiling water. Observation Not an Observation
4. The object is simple. Observation Not an Observation
5. The object has a pointed end. Observation Not an Observation
6. The object can be twisted at one end. Observation Not an Observation
7. The object has been used to write many words. Observation Not an Observation

Circles are your initial thought and boxes are the correct answer.
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>Liquid</td>
<td>Water Amount</td>
<td>Plant Height (mm)</td>
</tr>
<tr>
<td></td>
<td>Nutrient Amount</td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>Light Amount</td>
<td>Plant Height (mm)</td>
</tr>
</tbody>
</table>

**QUESTION**

Question our group will investigate:

- If we change the ______________, what will happen to the amount of plant growth?

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 values you will use in all your trials (control/value, Ex: seed type/fast plant).

<table>
<thead>
<tr>
<th>Seed Type</th>
<th>Fast Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TECHNIQUE

Rulers

Rulers are used to measure lengths of different items.

How to measure an item using a ruler:
1. Line up the zero mark on the ruler with one end of the item.
2. Follow the item down the ruler.
3. Record the measurement to the nearest whole number on the ruler at the other end of the item.
4. Repeat.

What is the height and width of each item?

1. 

   ![Image of an item]

   Height: ___________   Width: ___________

2. 

   ![Image of a pencil]

   Height: ___________   Width: ___________

3. 

   ![Image of a calculator]

   Height: ___________   Width: ___________
**PROCEDURE**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>Step 4</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5</td>
<td>Step 6</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

*Table*

Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. 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>Seed Type:</td>
<td><em>Fast Plant</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Type:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Amount:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Amount:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrient Type:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrient Amount:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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>
<tbody>
<tr>
<td>Initial Plant Height:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Plant Height:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in Plant Height:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The independent variable is the changing variable and the dependent variables are the final measurements/observations.
My experiment shows ________________________________________________________________
I acted like a scientist when ________________________________________________

________________________________________________________________________

________________________________________________________________________

TIE TO STANDARDS

1. Is plant growth predictable?

You would like to grow the tallest plant, circle the values below that would allow you to do this. If the variable does not affect how tall the plant will grow then circle either.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Either</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Type:</td>
<td>Gravel</td>
<td>Potting Soil</td>
<td>Either</td>
</tr>
<tr>
<td>Water Amount (in Bottom Cup):</td>
<td>100 mL</td>
<td>200 mL</td>
<td>Either</td>
</tr>
<tr>
<td>Nutrients (Salt) Amount:</td>
<td>None</td>
<td>50 mL</td>
<td>Either</td>
</tr>
</tbody>
</table>
2. Do plants grow in the light?
   Plot the data for the plants with water and with no water in the light.

3. What did plants in the light need to grow? ______________________
4. Do plants grow in the dark?
Plot the data for the plants with water and with no water in the dark.

5. What did plants in the dark need to grow? _____________________
6. Label the following picture of plants in the light with water with the correct day number (0, 5, 10, or 15 days) on which they were taken.

Day ________

Day ________

Day ________

Day ________

7. Label the following picture of plants in the dark with water with the correct day number (0, 5, 10, or 15 days) on which they were taken.

Day ________

Day ________

Day ________

Day ________
8. Is water or light more important for plant growth?

   WATER       LIGHT

9. Which would you predict to be taller at day 10, a plant in the light with water or a plant in the dark with water?

   DARK       LIGHT

10. Which would you predict to be healthier (greenest and more leaves) at day 10, a plant in the light with water or a plant in the dark with water?

    DARK       LIGHT

11. What conditions are needed in order for plants to live the longest life?

    __________________________  __________________________

12. What is a variable? ____________________________

                             ____________________________

13. What other variables might affect plant growth? (List at least 2)

   1. ____________________________

   2. ____________________________
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 boy is smiling. Observation Not an Observation
2. The boy is wearing a black shirt. Observation Not an Observation
3. The measuring cup is larger than the oil bottle. Observation Not an Observation
4. Cooking is exciting. Observation Not an Observation
5. There are equal number of measuring cups and bottles. Observation Not an Observation
6. The boy’s hair is black. Observation Not an Observation
7. The boy is making something to eat. Observation Not an Observation
WORD SEARCH

Absorb  Nutrient  Results
Dropper  Observation  Ruler
Experiment  Opinion  Sand
Inference  Prediction  Science
Millimeter  Potting Soil  Vermiculite
SciTrek is an educational outreach program that is dedicated to allowing 2nd-12th grade students to experience scientific practices firsthand. 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 chem.ucsb.edu/scitrek/ or contact us by e-mail at scitrekelementary@chem.ucsb.edu.

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