# Lead Information Packet

*Module 2: Plants*
*2nd Grade*

This document is not intended to give you all of the information you need to lead the module. It is only intended to be a reference during the module. You can find the complete instructions at as well as the notebook and picture packet used during the module.

**Note:** We **highly recommend** teachers complete the initial and final observation assessments and the technique activity outside of SciTrek sessions.

## Important Things to Remember During the Module

1. You are responsible for keeping track of time in the classroom and making sure ALL activities run smoothly. There will be a time card in the lead box with suggested times to start/stop each activity.
2. You are responsible for keeping volunteers and students on track.
3. Walk around during times volunteers are working with students and help struggling groups.

***Types of Documents:***

Notebook:
One given to every student, and is filled out by the student. The lead will use a notebook to write in as an example for students. The notebook the lead uses is referred to as the class notebook in these instructions.

Notepad:
One given to every group, and is filled out by the volunteer. In these instructions, the examples are narrower and taller than the notebook pages.

Picture Packet:
One per class that, if needed, the lead fills out. In these instructions, the examples are labeled, and, if applicable, filled out in blue.

In these instructions, all other example documents are labeled.

## Day 1: Observation Activity/Observations/Question/Materials Page

**Note:** We **highly recommend** teachers complete the initial observation assessment prior to Day 1 of the module. The suggested times in the lesson plan below are assuming the observation assessment was given prior to SciTrek's arrival.

***Schedule:*** *You are responsible for* ***BOLD*** *sections*

***Times if teacher gave assessment prior to SciTrek:***
**Introduction (SciTrek Lead) – 2 minutes**
**Observation Activity (SciTrek Lead) – 12 minutes**
**Observation Discussion (SciTrek Lead) – 7 minutes**
Observations (SciTrek Volunteers) – 17 minutes
**Question Discussion (SciTrek Lead) – 3 minutes**
Question (SciTrek Volunteers) – 11 minutes
Materials Page (SciTrek Volunteers) – 6 minutes
**Wrap-Up (SciTrek Lead) – 2 minutes**

***Times if SciTrek must give assessment:***
**Introduction (SciTrek Lead) – 2 minutes**
**Observation Assessment (SciTrek Lead) – 5 minutes**
**Observation Activity (SciTrek Lead) – 12 minutes**
**Observation Discussion (SciTrek Lead) – 7 minutes**
Observations (SciTrek Volunteers) – 16 minutes
**Question Discussion (SciTrek Lead) – 3 minutes**
Question (SciTrek Volunteers) – 9 minutes
Materials Page (SciTrek Volunteers) – 4 minutes
**Wrap-Up (SciTrek Lead) – 2 minutes**

***Preparation:***

1. Get the observation assessments and put them in the lead box.
2. Make sure volunteers are writing their names and group color on the whiteboard.
3. Make sure volunteers are passing out nametags.
4. Make sure volunteers are setting up for the initial observation.
5. Set up the document camera for the observation activity (page 1, picture packet and page 2, notebook).
6. Copy the chart from page 1 of the picture packet onto the board.
7. Assemble the experimental set-up demonstration.
    a. Fill two 100 mL graduated cylinders with 100 mL of water each.
    b. Fill two 3 oz. cups completely full of vermiculite.
    c. Plug in the lamp.
    d. Set out the materials above, along with large cup, medium cup with hole, and cloth strip, in a place where students can see.
8. Have two polarized filters and a 250 mL graduated cylinder available to show students during the observation discussion.

***Introduction:*** *(2 minutes – Full Class – SciTrek Lead)*

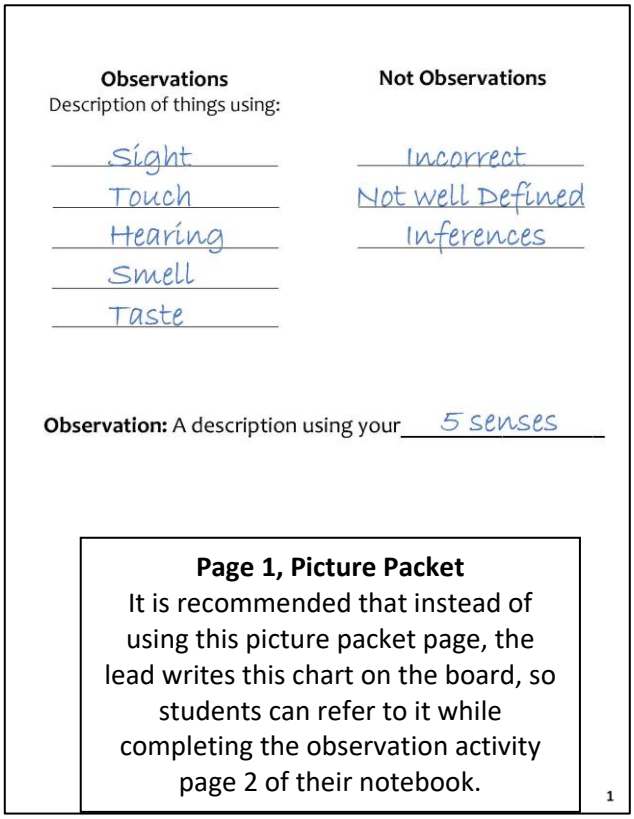
- Allow volunteers to introduce themselves.
- Introduce the module.

***Observation Assessment:*** *(5 minutes – Full Class – Given By Classroom Teacher Prior to SciTrek)*

- Read each statement and have students circle whether the statement is an observation, or not an observation.

***Observation Activity:*** *(12 minutes – Full Class – SciTrek Lead)*

- Have volunteers pass out notebooks.
- Have students fill out the front covers of their notebooks.
- Tell students, "We will be working to answer the question, 'What variables affect plant growth?'"
- Use the chart on the board that is a copy of page 1 of the picture packet (recommended), or put page 1 of the picture packet under the document camera.
- Have students help you fill in the table with what senses they use to make observations, along with things that are not observations.
- Have students generate an observation about something in the classroom using each of their senses, except for taste.
- Have students generate one statement in each of the *Not Observations* categories.
- Have volunteers pass out mechanical pencils.
- Fill in the definition for observation at the top of page 2 in class notebook, while students do the same.
- Read the directions (page 2, notebook).
- Read each statement, then give students approximately 15 seconds to circle whether the statement is an



| Observations<br>Description of things using: | Not Observations |
|---|---|
| Sight | Incorrect |
| Touch | Not well Defined |
| Hearing | Inferences |
| Smell | |
| Taste | |

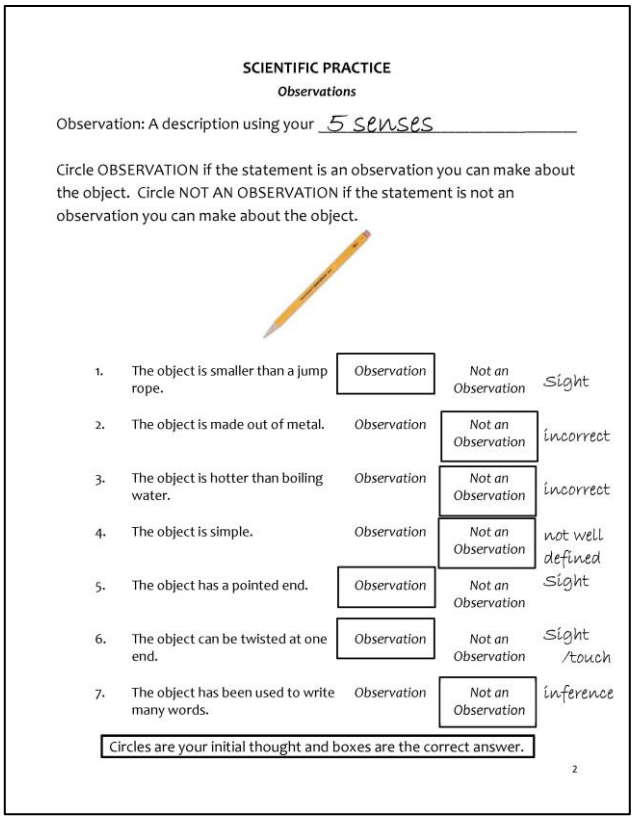
**Observation:** A description using your 5 senses

**Page 1, Picture Packet**
It is recommended that instead of using this picture packet page, the lead writes this chart on the board, so students can refer to it while completing the observation activity page 2 of their notebook.

1

observation, or not an observation, about the object (mechanical pencil). Then, go over the statement as a class, and have students box the correct answer. In addition:

- For statements that are observations, have students identify which sense they used. Write the sense in the margins of the class notebook (students do not have to write these in their notebooks).
- For statements that are not observations, have students identify why not, using the three categories on the list. Write why the statement is not an observation in the margins of the class notebook (students do not have to write these in their notebooks).
  - *1:* The object is smaller than a jump rope.
    Observation - Sense: Sight
  - *2:* The object is made out of metal.
    Not an Observation - Incorrect
  - *3:* The object is hotter than boiling water.
    Not an Observation - Incorrect
  - *4:* The object is simple.
    Not an Observation – Not Well Defined/Opinion
  - *5:* The object has a pointed end.
    Observation - Sense: Sight
  - *6:* The object can be twisted at one end.
    Observation – Sense: Touch
    **Note:** If you have twisted the end of the mechanical pencil, then the statement is an observation. If you have not tested it yet, then, the statement is not an observation, it is an inference. Make sure all students twist the end of the object, making this statement an observation.
  - *7:* The object has been used to write many words.
    Not an Observation - Inference



**SCIENTIFIC PRACTICE**

***Observations***

Observation: A description using your 5 senses

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 | Sight |
| 2. | The object is made out of metal. | Observation | **Not an Observation** | incorrect |
| 3. | The object is hotter than boiling water. | Observation | **Not an Observation** | incorrect |
| 4. | The object is simple. | Observation | **Not an Observation** | not well defined |
| 5. | The object has a pointed end. | **Observation** | Not an Observation | Sight |
| 6. | The object can be twisted at one end. | **Observation** | Not an Observation | Sight /touch |
| 7. | The object has been used to write many words. | Observation | **Not an Observation** | inference |

Circles are your initial thought and boxes are the correct answer.

2

- Have volunteers collect mechanical pencils.

***Observation Discussion:*** *(7 minutes – Full Class – SciTrek Lead)*

- Review the class question, "What variables affect plant growth?"
- Tell students, "We will first explore how soil type affects plant growth."
- Show students how plants were made:
  - Feed the 5 cm x 15 cm towel through the hole in the medium cup so 4 cm are sticking inside cup.
  - Place the medium cup into the large cup.
  - Put two small cups of vermiculite (make sure you use the word vermiculite with students) into the medium cup.
  - Put 1 "seed" into the vermiculite. (You will not have a seed, but pretend to put one in so students think you have a seed.)
  - Pour 200 mL of water over the vermiculite.
  - Set the cup under light.
- Have students move to their groups.

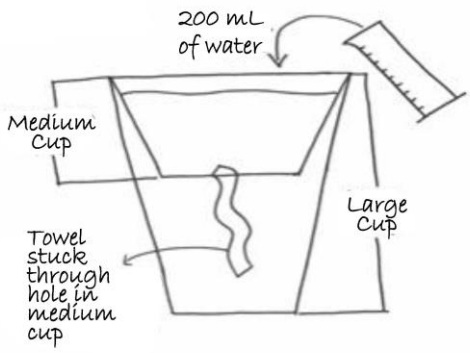
- If a student does not have a nametag, identify the group color with the least number of students in it, and write the student's name on one of the extra nametags, that are in the lead box, using that color of marker.

***Observations:*** *(17 minutes –Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Make sure groups are moving along and only spending ~5 minutes recording observations of how the plants were made, ~5 minutes making observations of the lettered cups (seeds planted today), comparing relative amounts of water in each lettered cup, and discussing what this means about how much liquid the different soil types absorb, and ~ 5 minutes recording observations about the numbered cups (seeds planted 7 day ago).

**OBSERVATIONS**

Experimental Set-Up:




- 2 small cups of soil in medium cup
- Water poured through soil
- Cup put under full light

1

**OBSERVATIONS**

Seeds Planted: Today

Cup A:
- Potting soil
- Water is dirty
- Soil is damp

Cup B:
- Vermiculite
- Water is clear
- Soil is damp

Cup C:
- Rocks
- Water is clear
- Soil is dry

Other Observations:
- Vermiculite had least amount of water in big cup, absorbed the most water
- Rocks had most amount of water in big cup, absorbed the least water

2

**OBSERVATIONS**

Seeds Planted: 7 days ago

Cup 1:
- Potting soil
- Plant
- Soil is damp

Cup 2:
- Vermiculite
- Plant
- Soil is damp

Cup 3:
- Rocks
- No plant
- Soil is dry

Other Observations:
- Plant in potting soil is the tallest.
- Less water in the large cups with seeds planted seven days ago, than planted today

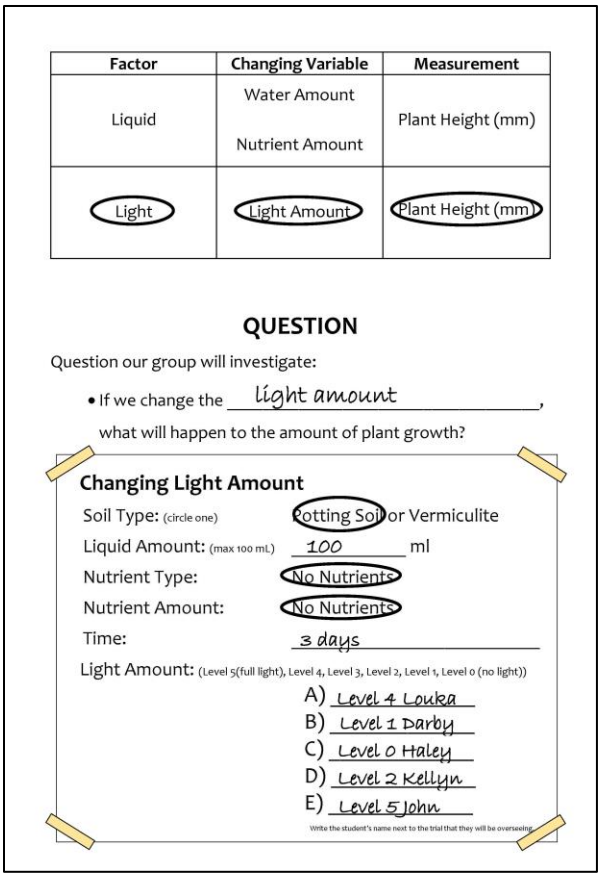
3

***Question Discussion:*** *(3 minutes – Full Class– SciTrek Lead)*

- Have groups share what they did/learned.
  - The cups contained potting soil, vermiculite, and rocks.
  - The vermiculite absorbed the most water, and the rocks absorbed the least water.
  - The plant grew the tallest in the potting soil, and there was no plant growth in the rocks.
- Discuss how soil type relates to plant growth.
- Review how this finding would help someone that wants to plant a garden.
- Introduce the word "variable."
- Go over the options for variables that students can change: light amount (show polarizing filters), liquid amount (show 250 mL graduated cylinders), nutrient amount (sugar, salt, or fertilizer).

***Question:*** *(11 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Encourage groups to pick different changing variables.



| Factor | Changing Variable | Measurement |
|---|---|---|
| Liquid | Water Amount<br>Nutrient Amount | Plant Height (mm) |
| Light | Light Amount | Plant Height (mm) |

**QUESTION**

Question our group will investigate:

- If we change the light amount,

what will happen to the amount of plant growth?

**Changing Light Amount**

Soil Type: (circle one) Potting Soil or Vermiculite

Liquid Amount: (max 100 mL) 100 ml

Nutrient Type: No Nutrients

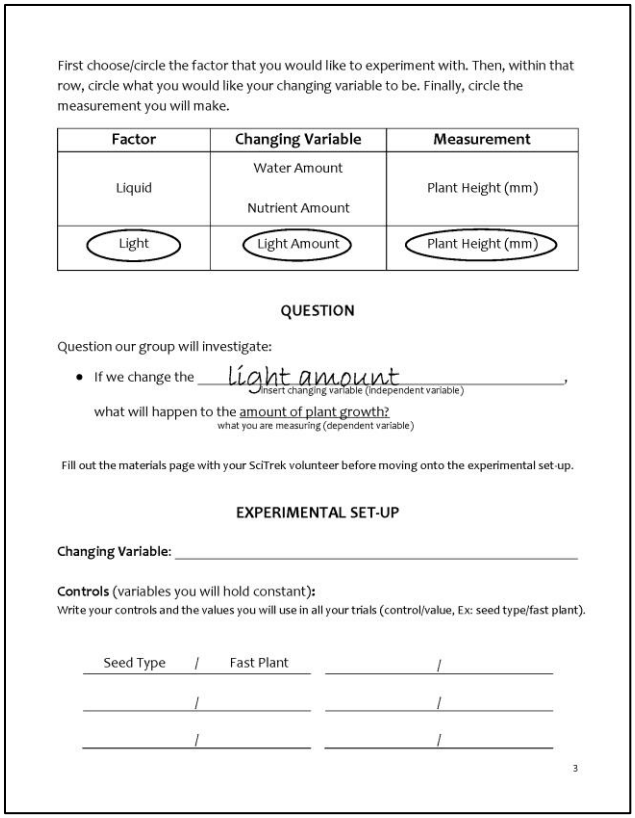
Nutrient Amount: No Nutrients

Time: 3 days

Light Amount: (Level 5(full light), Level 4, Level 3, Level 2, Level 1, Level 0 (no light))

A) Level 4 Louka
B) Level 1 Darby
C) Level 0 Haley
D) Level 2 Kellyn
E) Level 5 John

Write the student's name next to the trial that they will be overseeing.



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.

| Factor | Changing Variable | Measurement |
|---|---|---|
| Liquid | Water Amount<br>Nutrient Amount | Plant Height (mm) |
| Light | Light Amount | Plant Height (mm) |

**QUESTION**

Question our group will investigate:

- If we change the light amount (insert changing variable (independent variable)),

what will happen to the amount of plant growth? (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)**:**
Write your controls and the values you will use in all your trials (control/value, Ex: seed type/fast plant).

Seed Type / Fast Plant _____ / _____

_____ / _____ / _____

_____ / _____ / _____

3

***Materials Page:*** *(6 minutes – Groups – SciTrek Volunteers)*

- Give groups who are changing the water amount a 250 mL graduated cylinder, and groups who are changing the nutrient amount a 100 mL graduated cylinder.
  - Volunteers can write on these with wet erase pens.
- Walk around, and help groups who are struggling.
- Make sure groups fill out the materials page correctly and completely, and then tape it onto the notepad.

***Wrap-Up:*** *(2 minutes – Full Class – SciTrek Lead)*

- Go over what students will do next session.
- **Make sure you leave the classroom teacher with the class notebook, and all students' notebooks.**

## Day 2: Experimental Set-Up/Procedure/Results Table/Experiment

**Note:** We **highly recommend** teachers complete the technique activity prior to Day 2 of the module. The suggested times in the lesson plan below are assuming that the technique activity was given prior to SciTrek's arrival.

***Schedule:*** *You are responsible for* ***BOLD*** *sections*

***Times if teacher did technique prior to SciTrek:***
**Introduction (SciTrek Lead) – 2 minutes**
Experimental Set-Up (SciTrek Volunteers) – 10 minutes
Procedure (SciTrek Volunteers) – 20 minutes
Results Table (SciTrek Volunteers) – 5 minutes
Experiment (SciTrek Volunteers) – 21 minutes
**Wrap-Up (SciTrek Lead) – 2 minutes**

***Times if SciTrek must do technique:***
**Introduction (SciTrek Lead) – 2 minutes**
**Technique (SciTrek Lead) – 10 minutes**
Experimental Set-Up (SciTrek Volunteers) – 7 minutes
Procedure (SciTrek Volunteers) – 19 minutes
Results Table (SciTrek Volunteers) – 5 minutes
Experiment (SciTrek Volunteers) – 15 minutes
**Wrap-Up (SciTrek Lead) – 2 minutes**

***Preparation:***

1. Get notebooks and give them to the volunteers to separate into groups, attach nametags, and set out.
2. Get SciTrek's second grade rulers, and put them in the lead box.
3. Set up the light level boxes.
    a. Set up levels 0-4 boxes in ascending with order, with lights shining through the filters, and the lids left off.
    b. Set up a lamp for level 5 lighting. **Note:** This will not be in a box.
    c. Do not plug extension cords into other extension cords.
    d. Remind the teacher that it is important that the lights are left on until the next SciTrek session.

***Introduction:*** *(2 minutes – Full Class – SciTrek Lead)*

- Review the class question, what students did, and learned last session.
    - Ask students, "How will we know if a value of a variable, such as soil type, is 'better' than another value?"
        - Make sure students come up with the idea of comparing plant heights.

***Technique:*** *(10 minutes – Full Class – Done By Classroom Teacher Prior to SciTrek)*

- Show students how to use a ruler, and to measure in mm.
- Read the directions on page 4 of the notebook, and answer the first question as a class.
- Have students complete the other two questions individually.
- Review each question.

**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.**


Height: 24 mm Width: 70 mm

**2.**

Height: 11 mm Width: 41 mm

**3.**

Height: 57 mm Width: 45 mm

4

***Experimental Set-Up:*** *(10 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Make sure all control blanks are filled out.

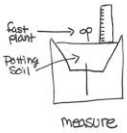
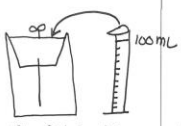
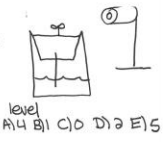
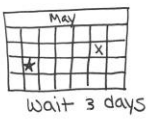
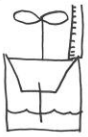
**EXPERIMENTAL SET-UP**

**Changing Variable:** Light amount

**Controls** (variables you will hold constant):

| | | | |
|---|---|---|---|
| Seed Type | Fast Plant | Nutrient Type | No Nutrients |
| Soil Type | Potting Soil | Nutrient Amount | No Nutrients |
| Light Amount | 100 mL | Time | 3 Days |

**PROCEDURE**

| Step 1 | Step 2 | Step 3 |
|---|---|---|
|   |   |   |
| **Step 4** | **Step 5** | **Step 6** |
|   |   |   use number line to find change in plant height |

5

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.

| Factor | Changing Variable | Measurement |
|---|---|---|
| Liquid | Water Amount<br>Nutrient Amount | Plant Height (mm) |
| Light | Light Amount | Plant Height (mm) |

**QUESTION**

Question our group will investigate:

- If we change the light amount (insert changing variable (independent variable)), what will happen to the amount of plant growth? (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:** light amount

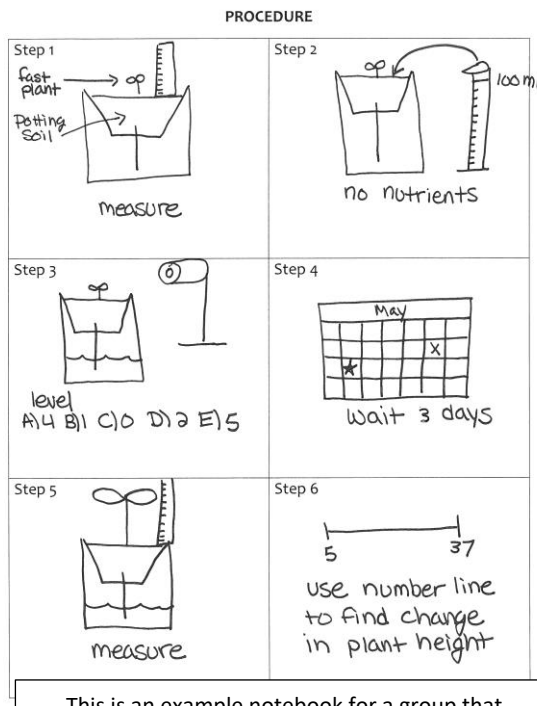
**Controls** (variables you will hold constant):
Write your controls and the values you will use in all your trials (control/value, Ex: seed type/fast plant).

| | | | |
|---|---|---|---|
| Seed Type | Fast Plant | Nutrient Type | No Nutrients |
| Soil Type | Potting Soil | Nutrient Amount | No Nutrients |
| Liquid Amount | 100 mL | Time | 3 Days |

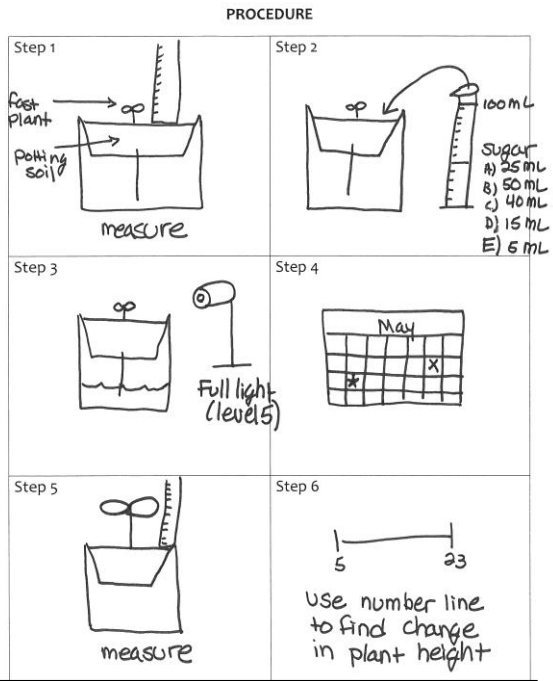
3

***Procedure:*** *(20 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Make sure procedure drawings have (in writing) all values of the controls and changing variable, as well as the data that will be collected, and the calculation that will be done.
- Volunteers should be drawing one picture, and having students copy that step before moving on to the next step.




This is an example notebook for a group that chose light amount as their changing variable.




This is an example notebook for a group that chose nutrient amount as their changing variable.

***Results Table:*** *(5 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Make sure control values are written in the *Trial A* box, with an arrow through the rest of the trials' boxes, while changing variable values are written in each trial's box.

**RESULTS**
***Table***

| Variables | | Trial A | Trial B | Trial C | Trial D | Trial E |
|---|---|---|---|---|---|---|
| Seed Type: | | ***Fast Plant*** | → | → | → | → |
| Soil Type: | | Potting soil | → | → | → | → |
| Liquid Amount: | | 100 mL | → | → | → | → |
| Light Amount: | | Level 4 | Level 1 | Level 0 | Level 2 | Level 5 |
| Nutrient Type: | | No nutrients | → | → | → | → |
| Nutrient Amount: | | No nutrients | → | → | → | → |
| Time: | | 3 days | → | → | → | → |
| **Data** | | **Trial A** | **Trial B** | **Trial C** | **Trial D** | **Trial E** |
| Measurements: | Initial Plant Height: | 7 mm | 11 mm | 8 mm | 10 mm | 10 mm |
| | Final Plant Height: | | | | | |
| | Change in Plant Height: | | | | | |
| Observations: | Other: | | | | | |

6

**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.

| Variables | | Trial A | Trial B | Trial C | Trial D | Trial E |
|---|---|---|---|---|---|---|
| Seed Type: | | ***Fast Plant*** | → | → | → | → |
| Soil Type: | | Potting Soil | → | → | → | → |
| Liquid Amount: | | 100 mL | → | → | → | → |
| Light Amount: | | Level 4 | Level 1 | Level 0 | Level 2 | Level 5 |
| Nutrient Type: | | No nutrients | → | → | → | → |
| Nutrient Amount: | | No nutrients | → | → | → | → |
| Time: | | 3 Days | → | → | → | → |
| **Data** | | **Trial A** | **Trial B** | **Trial C** | **Trial D** | **Trial E** |
| Measurements: | Initial Plant Height: | 7 mm | 11 mm | 8 mm | 10 mm | 10 mm |
| | Final Plant Height: | | | | | |
| | Change in Plant Height: | | | | | |
| Observations: | Other: | | | | | |

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

6

***Experiment:*** *(21 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Volunteers should write on the graduated cylinder with the wet erase pens.
- Make sure groups are recording their initial plant heights in the notepad, and in notebooks.
- Check that groups who are changing the nutrient amount are first putting the nutrient into the graduated cylinder, and then adding water up to the liquid amount.
    - For example, a group that had 25 mL of sugar for its nutrient amount, and 75 mL of liquid for its liquid amount, would put 25 mL of sugar into the graduated cylinder, and add water to the 75 mL mark (50 mL of water).
- Make sure groups are putting their plants under the correct amount of light.

***Wrap-Up:*** *(2 minutes – Full Class – SciTrek Lead)*

- Go over what students will do next session.

## Day 3: Experiment/Graph/Results Summary

***Schedule:*** *You are responsible for* ***BOLD*** *sections*

**Introduction (SciTrek Lead) – 2 minutes**
Experiment (SciTrek Volunteers) – 30 minutes
Graph (SciTrek Volunteers) – 10 minutes
Results Summary (SciTrek Volunteers) – 16 minutes
**Wrap-Up (SciTrek Lead) – 2 minutes**

***Preparation:***

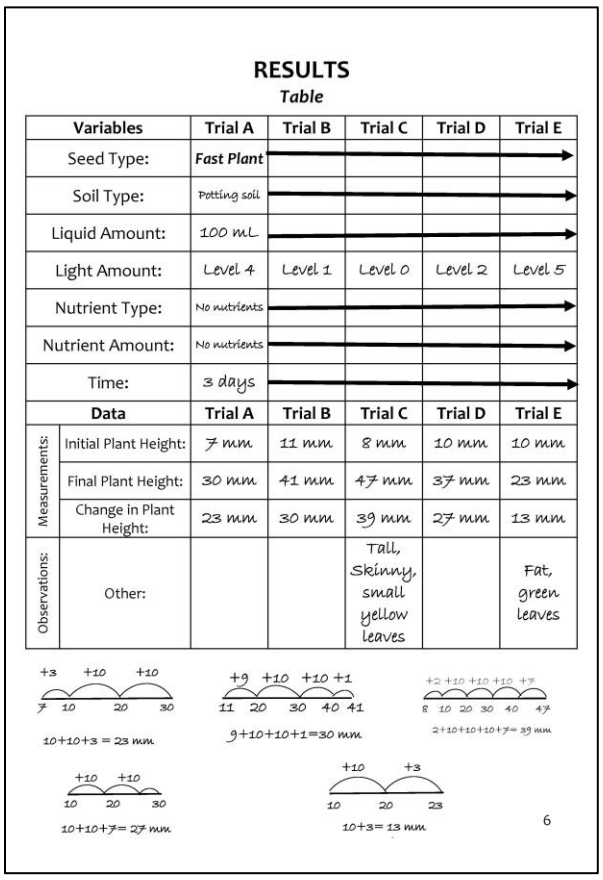
1. Make sure volunteers are setting out notebooks.
2. Remove the plants from the boxes, and give them to the appropriate volunteer.
3. Turn off lights, put lamps in boxes, and stack boxes to be returned to SciTrek (this can be done after the module).

***Introduction:*** *(2 minutes – Full Class – SciTrek Lead)*

- Review the class question, what students did, and learned, last session.

***Experiment:*** *(30 minutes – Groups – SciTrek Volunteers)*

- Help pass out plants to the correct groups.
- Walk around, and help groups who are struggling.
- All measurements will be recorded in the notepad, and subtraction will be done on the notepad. Students only need to record the final plant height, and the change in plant height, in their notebooks.
- Check on groups who are changing nutrient amount and using salt or sugar. Some of these plants might shrink. Even if a plant shrank, have volunteers help students find the difference between the plant heights, and put an asterisk next to the value, to indicate that it shrank.



**RESULTS**

*Table*

| Variables | | Trial A | Trial B | Trial C | Trial D | Trial E |
|---|---|---|---|---|---|---|
| Seed Type: | | *Fast Plant* | → | → | → | → |
| Soil Type: | | Potting soil | → | → | → | → |
| Liquid Amount: | | 100 mL | → | → | → | → |
| Light Amount: | | Level 4 | Level 1 | Level 0 | Level 2 | Level 5 |
| Nutrient Type: | | No nutrients | → | → | → | → |
| Nutrient Amount: | | No nutrients | → | → | → | → |
| Time: | | 3 days | → | → | → | → |
| **Data** | | **Trial A** | **Trial B** | **Trial C** | **Trial D** | **Trial E** |
| Measurements: | Initial Plant Height: | 7 mm | 11 mm | 8 mm | 10 mm | 10 mm |
| | Final Plant Height: | 30 mm | 41 mm | 47 mm | 37 mm | 23 mm |
| | Change in Plant Height: | 23 mm | 30 mm | 39 mm | 27 mm | 13 mm |
| Observations: | Other: | | | Tall, Skinny, small yellow leaves | | Fat, green leaves |

+3 +10 +10
7 10 20 30
10+10+3 = 23 mm

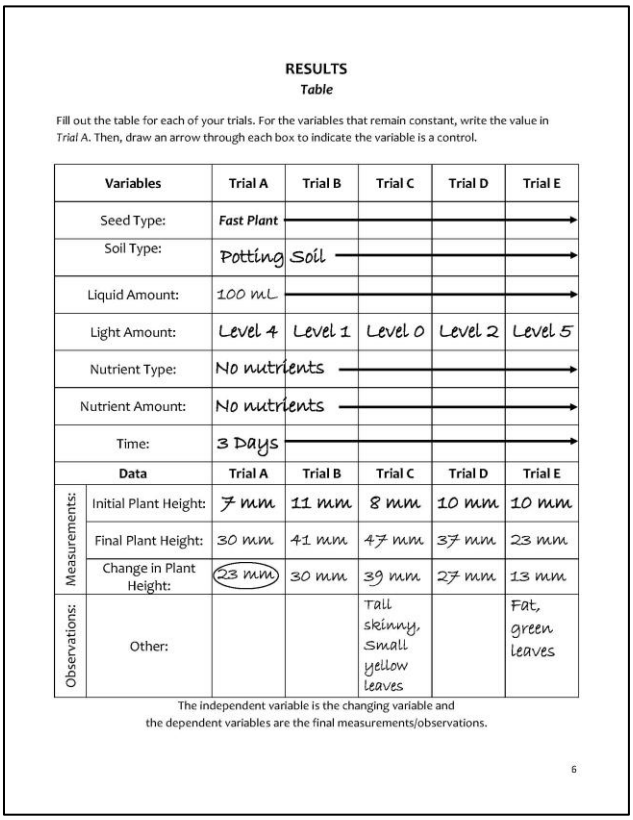
+9 +10 +10 +1
11 20 30 40 41
9+10+10+1=30 mm

+2 +10 +10 +10 +7
8 10 20 30 40 47
2+10+10+10+7= 39 mm

+10 +10
10 20 30
10+10+7= 27 mm

+10 +3
10 20 23
10+3= 13 mm

6



**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.

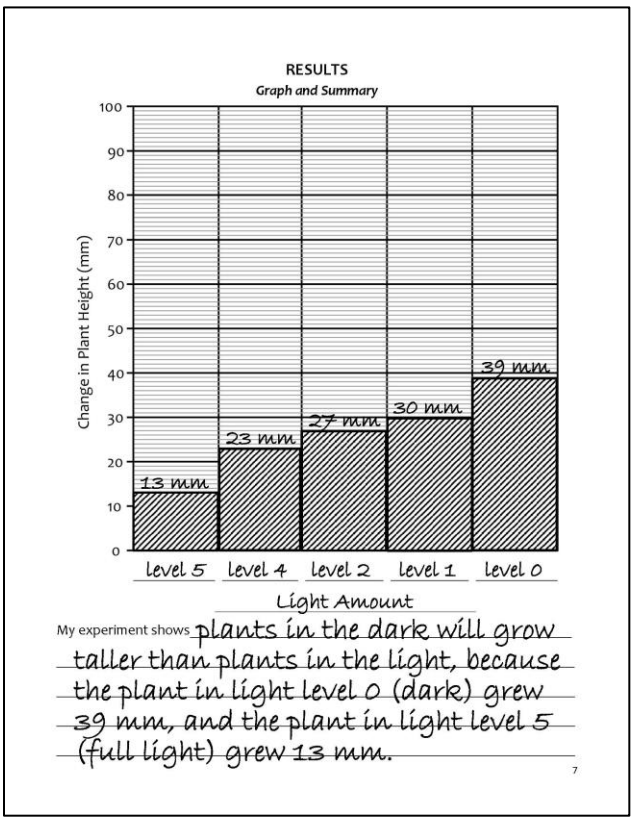
| Variables | | Trial A | Trial B | Trial C | Trial D | Trial E |
|---|---|---|---|---|---|---|
| Seed Type: | | *Fast Plant* | → | → | → | → |
| Soil Type: | | Potting Soil | → | → | → | → |
| Liquid Amount: | | 100 mL | → | → | → | → |
| Light Amount: | | Level 4 | Level 1 | Level 0 | Level 2 | Level 5 |
| Nutrient Type: | | No nutrients | → | → | → | → |
| Nutrient Amount: | | No nutrients | → | → | → | → |
| Time: | | 3 Days | → | → | → | → |
| **Data** | | **Trial A** | **Trial B** | **Trial C** | **Trial D** | **Trial E** |
| Measurements: | Initial Plant Height: | 7 mm | 11 mm | 8 mm | 10 mm | 10 mm |
| | Final Plant Height: | 30 mm | 41 mm | 47 mm | 37 mm | 23 mm |
| | Change in Plant Height: | 23 mm | 30 mm | 39 mm | 27 mm | 13 mm |
| Observations: | Other: | | | Tall skinny, Small yellow leaves | | Fat, green leaves |

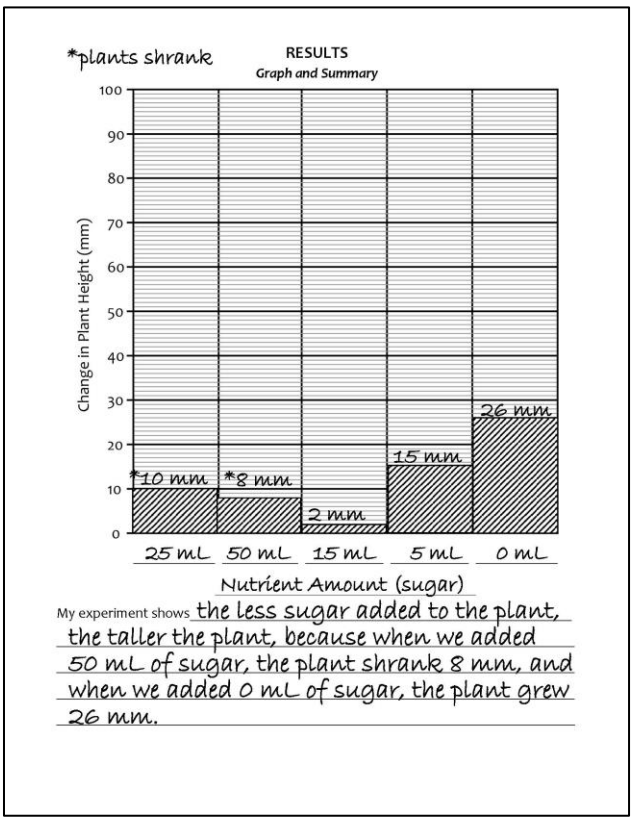
The independent variable is the changing variable and the dependent variables are the final measurements/observations.

6

***Graph:*** *(10 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Make sure volunteers circle the change in plant height for the trial each student is in charge of, to prevent them from graphing the final plant height.
- Make sure students are graphing their trial on the individual graph piece with the value of the changing variable written underneath (Ex: 25 mL), not the trial letter (Ex: B).
    - If a plant shrank, have students still graph a positive change in plant height, but put an asterisk above that data point on the individual graph piece, to indicate that it shrank. For example, if a plant was 5 cm initially, and 0 cm after shrinking, the student would graph a 5 cm change in plant height, denoted by an asterisk.
- Make sure volunteers are having students arrange the individual graph pieces in increasing order by the change in plant height, and then taping them onto the group notepad.
    - When arranging values, have students put plants that shrank (asterisk on partial graph pieces), before they put the partial graph pieces for plants that grew, this will make their graph look like a parabola (U-shaped; below on the right).
- Make sure students are labeling their x-axes, and writing the numerical value of the change in plant height on top of each column.




***Results Summary:*** *(16 minutes – Groups – SciTrek Volunteers)*

- Walk around, and help groups who are struggling.
- Make sure groups are generating a claim (ideally the claim will allow them to make a prediction about future experiments), and use at least two specific data points to support it.
    - If groups use observations as their data, make sure their data statement includes "we observed."
    - If groups use measurements as their data, make sure they are including numerical values in their data statement.
    - Do not reference trial letters in the results summary.
- Volunteers struggle with results summaries, therefore, check each group's results summary.
- Make sure students fill out the sentence frame on page 8, *I acted like a scientist when*.

***Wrap-Up:*** *(2 minutes – Full Class – SciTrek Lead)*

- Go over what students will do next session.

## Day 4: Poster Making

***Schedule:*** *You are responsible for* ***BOLD*** *sections*

**Introduction (SciTrek Lead) – 2 minutes**
Experimental Discussion (SciTrek Volunteers) – 17 minutes
Poster Making (SciTrek Volunteers) – 36 minutes
**Wrap-Up (SciTrek Lead) – 5 minutes**

***Preparation:***

1. Make sure volunteers are setting out notebooks.
2. Find a place to leave student posters.

***Introduction:*** *(2 minutes– Full Class – SciTrek Lead)*

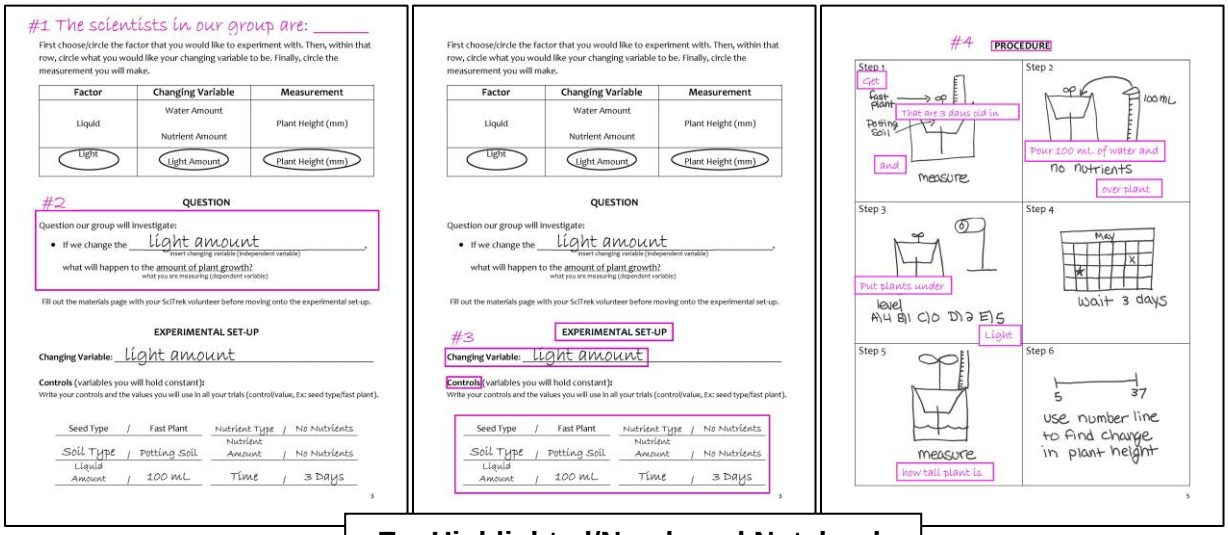
- Review the class question, what students did, and learned last session.

***Experimental Discussion:*** *(17 minutes – Groups – SciTrek Volunteers)*

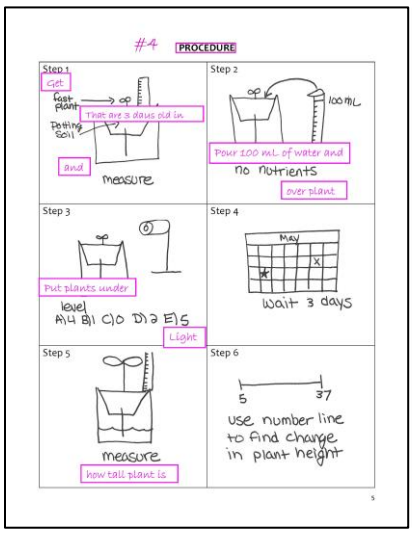
- Make sure each group is explaining their experiment, and their findings, to their volunteer.
- Make sure volunteers are asking students questions that have them generate predictions based on their data.

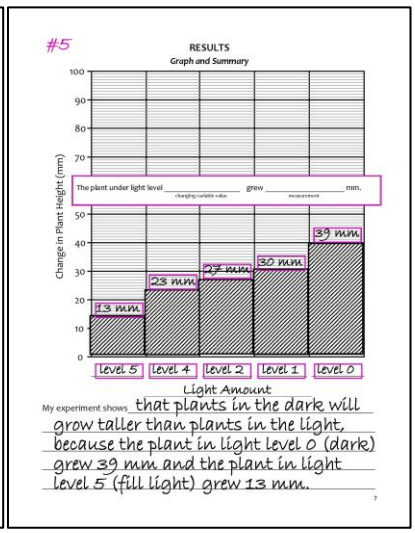
***Poster Making:*** *(36 minutes – Groups – SciTrek Volunteers)*

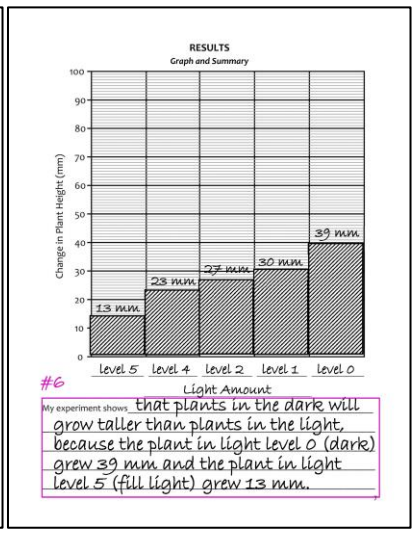
- Help volunteers glue poster pieces onto the posters. When gluing, make sure you, or the volunteers (not the students), are gluing the poster in the exact order that is shown on the diagram, and that the poster has a landscape orientation.
- Make sure the student in each group who is presenting the results graph has the appropriate sentence frame sticker in their notebook, and the volunteer has gone over how to present the five sentences, with the student, several times.
- Make sure the volunteer is asking the student who is completing the procedure to tell them in their own words what they did in each step, and the volunteer is writing the student's words on each picture to form complete sentences. Students should not write these words on their poster pieces. Example possible written-in words are boxed in the procedure pictures below.
- Each student should have the part(s) they are presenting highlighted, and numbered, in their notebook: 1) scientists' names, 2) question, 3) experimental set-up, 4) procedure, 5) results graph, and 6) results summary (see pictures below).
    - Remind volunteers, if a student is presenting multiple parts, they should have multiple sections highlighted, and numbered, in their notebook.
- Volunteers often forget to highlight student notebooks, so make sure this gets done before Day 5.

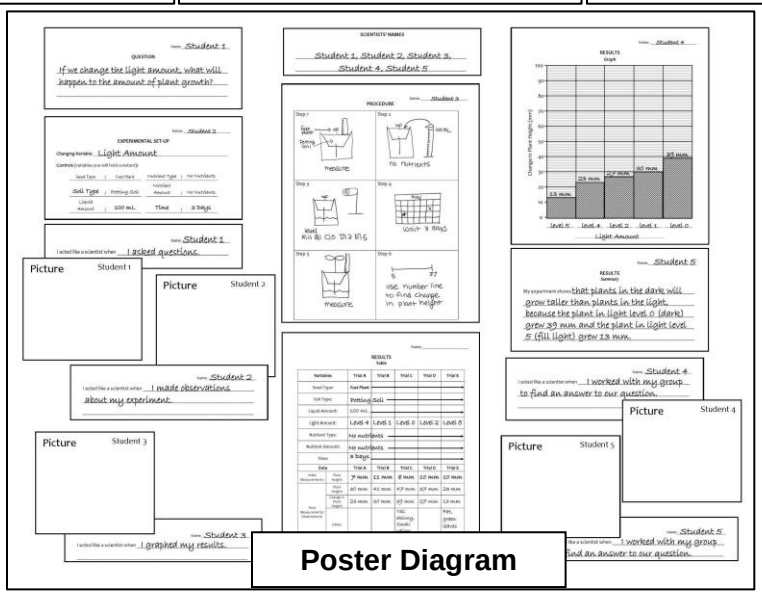



**Ex: Highlighted/Numbered Notebook**




***Wrap-Up:*** *(5 minutes – Full Class – SciTrek Lead)*

- Ask students the following questions:
  - How did you act like a scientist during this project?
  - What did you do, that scientists do?

## Day 5: Poster Presentations

***Schedule:*** *You are responsible for* ***BOLD*** *sections*

**Introduction (SciTrek Lead) – 2 minutes**
Practice Posters (SciTrek Volunteers) – 15 minutes
**Poster Presentations (SciTrek Volunteers/SciTrek Lead) – 41 minutes**
**Wrap-Up (SciTrek Lead) – 2 minutes**

***Preparation:***

1. Make sure volunteers are setting out notebooks.
2. Assign volunteers a new group to work with.
3. Set up the document camera for the *Notes on Presentations* (page 2, picture packet).
4. Organize posters so experiments featuring the same changing variable are presented back to back, and posters are presented from simplest to understand, to most difficult to understand (suggested order: nutrient amount (salt, sugar, fertilizer), water amount, light amount).

***Introduction:*** *(2 minutes – Full Class – SciTrek Lead)*

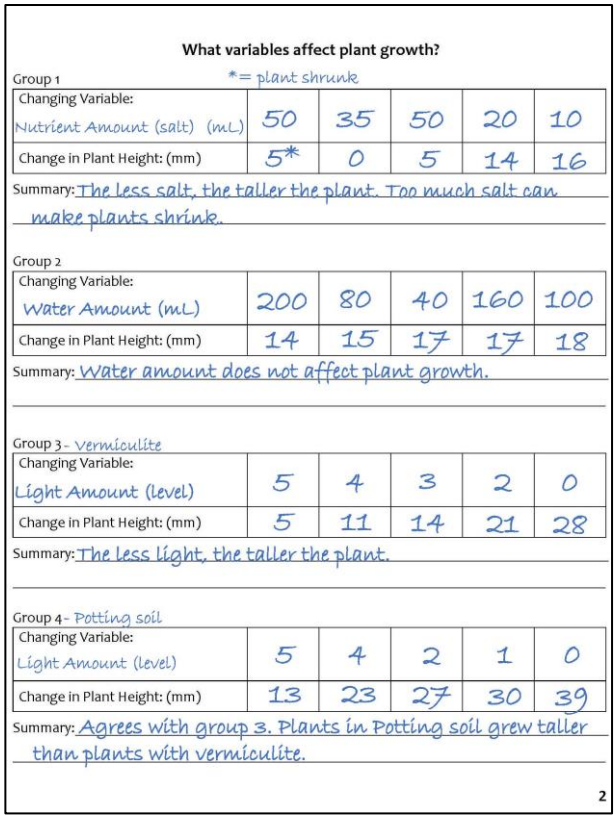
- Review the class question, what students did, and learned, last session.
- Explain to students they will work with a new volunteer today.

***Practice Posters:*** *(15 minutes – Groups – SciTrek Volunteers)*

- **Do not give students more than 15 minutes to review their experiment and practice their poster, or you will run out of time.**
- Have volunteers rotate groups, so that each group can explain their experiment and practice their poster with a new volunteer.
- Make sure volunteers are having students explain their experiment, and asking them questions that have them generate predictions based on their data.
- Make sure students are reading from their notebooks and practicing the poster, in the following order: 1) scientists' names, 2) question, 3) experimental set-up, 4) procedure, 5) results graph, and 6) results summary. They will NOT read the *I acted like a scientist when* or results table from their poster.

***Poster Presentations:*** *(41 minutes – Full Class – SciTrek Volunteers/SciTrek Lead)*

- Have students present their posters.
- While posters are being presented, record each group's changing variable values, and their data, on page 2 of the picture packet.
    - After a group reads their question, stop the presentation, and have the class identify the changing variable. Then, record it in the picture packet.
    - When a group reads their results graph, record the values of the changing variable, and their measurements.
- After each presentation, ask students:
    - What questions do you have for this group?
- Once students have asked their questions (make sure each student answers a question, you should ask at least one question per presentation), ask the whole class:
    - What was the group's changing variable?
    - What patterns do you see in the (insert changing variable)?
    - What patterns do you see in the change in plant height?



What variables affect plant growth?

Group 1 *= plant shrunk

| Changing Variable: Nutrient Amount (salt) (mL) | 50 | 35 | 50 | 20 | 10 |
|---|---|---|---|---|---|
| Change in Plant Height: (mm) | 5* | 0 | 5 | 14 | 16 |

Summary: The less salt, the taller the plant. Too much salt can make plants shrink.

Group 2

| Changing Variable: Water Amount (mL) | 200 | 80 | 40 | 160 | 100 |
|---|---|---|---|---|---|
| Change in Plant Height: (mm) | 14 | 15 | 17 | 17 | 18 |

Summary: Water amount does not affect plant growth.

Group 3 - Vermiculite

| Changing Variable: Light Amount (level) | 5 | 4 | 3 | 2 | 0 |
|---|---|---|---|---|---|
| Change in Plant Height: (mm) | 5 | 11 | 14 | 21 | 28 |

Summary: The less light, the taller the plant.

Group 4 - Potting soil

| Changing Variable: Light Amount (level) | 5 | 4 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Change in Plant Height: (mm) | 13 | 23 | 27 | 30 | 39 |

Summary: Agrees with group 3. Plants in Potting soil grew taller than plants with vermiculite.

2

**Page 2, Picture Packet**

    - Can someone put what we learned into a sentence?
- Record what students learned under the *Summary* on page 2 of the picture packet.
- After all presentations are over, have students tell you the variable values they would select for each scenario: 1) to allow a plant to grow as tall as possible, and 2) to allow a plant to grow as healthy (greenest leaves) as possible.

***Wrap-Up:*** *(2 minutes – Full Class – SciTrek Lead)*

- Tell students, "The mentors who have been working with you are undergraduate, and graduate, students who volunteer their time so you can do experiments. This is the last day you will see your volunteers, so we should say thank you and goodbye."
- Have students remove the paper parts of their nametags (which they can keep) from the plastic holders, and return the plastic holder to their volunteers.

## Day 6: Draw a Scientist/Tie to Standards/Content Assessment

**Note:** We **highly recommend** teachers complete the final observation assessment prior to Day 6 of the module. The suggested times in the lesson plan below are assuming that the observation assessment was given prior to SciTrek's arrival.

***Schedule:*** *You are responsible for* ***BOLD*** *sections*

***Times if teacher gave assessment prior to SciTrek:***
**Draw a Scientist (SciTrek Lead) – 5 minutes**
**Tie to Standards (SciTrek Lead) – 45 minutes**
**Content Assessment (SciTrek Lead) – 10 minutes**

***Times if SciTrek must give assessment:***
**Observation Assessment (SciTrek Lead) – 10 minutes**
**Draw a Scientist (SciTrek Lead) – 5 minutes**
**Tie to Standards (SciTrek Lead) – 40 minutes**
**Content Assessment (SciTrek Lead) – 10 minutes**

***Preparation:***

1. Get the observation assessments, and put them in the lead box.
2. If the teacher is not leading the tie to standards activity, do the following:
    a. Ask the teacher if they completed the SciTrek final survey. If not, give them the QR code from the lead box, ask them to go to the website (at a later time), and fill out the evaluation of the program.
    b. Give the teacher an extra notebook, and have them fill it out with their students, to follow along.
    c. Collect the teacher's lab coat, and put it in the lead box.
3. If you are a teacher, and have not completed the SciTrek final survey, take the QR code from the lead box, and use fill out the evaluation of the program, at a later time.
4. Pass out notebooks.
5. Set up the document camera for the tie to standards activity (pages 8-12, notebook, and pages 3-10, picture packet).
6. Have the 6 plants ready to show students.
7. Put your lab coat in the lead box, at the end of the day.

***Observation Assessment:*** *(5 minutes – Full Class – Given By Classroom Teacher Prior to SciTrek)*

- Pass out assessments and black beads.
- Read each statement, and have students circle whether the statement is an observation, or not an observation.
- Collect black beads.

- Have students turn the page over, and answer the Attitudes Towards Science Questions.
- Collect assessments.

***Draw a Scientist:*** *(5 minutes – Full Class – SciTrek Lead)*

- Pass out the Draw a Scientist page.
- Give students exactly 4 minutes to draw a picture of a scientist.
- If students drew a specific person, have them write who they drew on the line at the bottom of the page. Have them leave it blank if they drew a general person/picture.
- Collect assessments.

***Tie to Standards:*** *(45 minutes – Full Class – SciTrek Lead)*

*Plant Growth Predictability:* (5 minutes)

- Ask students, "Is plant growth predictable?"
- Have students predict which soil type would give the tallest plant, and have them share their reasoning.
- Show students corresponding plants.
- Repeat process for water amount, and nutrient (salt) amount.

1. Is plant growth predictable?

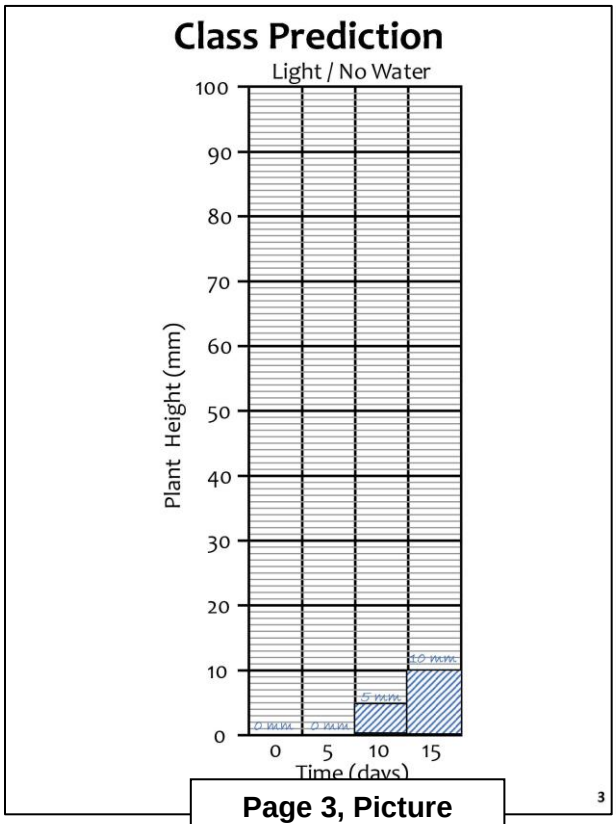
You would like to grow the tallest plant, circle the values below that would allow you to do this. If the variable does not affect how tall the plant will grow then circle either.

| Variable | Option 1 | Option 2 | Either |
|---|---|---|---|
| Soil Type: | Gravel | Potting Soil | Either |
| Water Amount (in Bottom Cup): | 100 mL | 200 mL | Either |
| Nutrients (Salt) Amount: | None | 50 mL | Either |

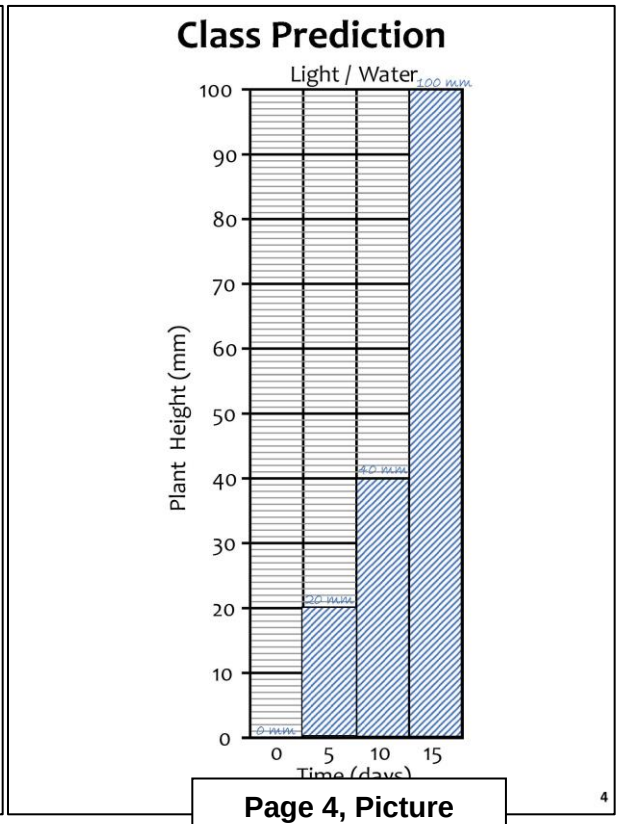
**Page 8, Notebook**

*Plants in the Light Prediction: (10 minutes)*

- Have students predict what they think will happen to the plant height if a seed is planted in the light, with no water, and left there for 15 days.
- Record student ideas on the class prediction graph (page 3, picture packet).
- Have students predict what they think will happen to the plant height if a seed is planted in the light, with water, and left there for 15 days.
- Record student ideas on the class prediction graph (page 4, picture packet).




**Page 3, Picture Packet**




**Page 4, Picture Packet**

*Effect of Light and Water on Plant Growth: (10 minutes)*

- As a class, graph what happened to a seed in the light, with no water, over the course of 15 days (page 5, picture packet [a sheet of paper is behind page 5 to cover data you do not want students to see]).
- Compare the class predictions to the actual data.
- As a class, graph what happened to a seed in the light, with water, over the course of 15 days (page 5, picture packet).
- Compare the class predictions to the actual data.
- Ask the students, "What did plants in the light need to grow?"
    - Water

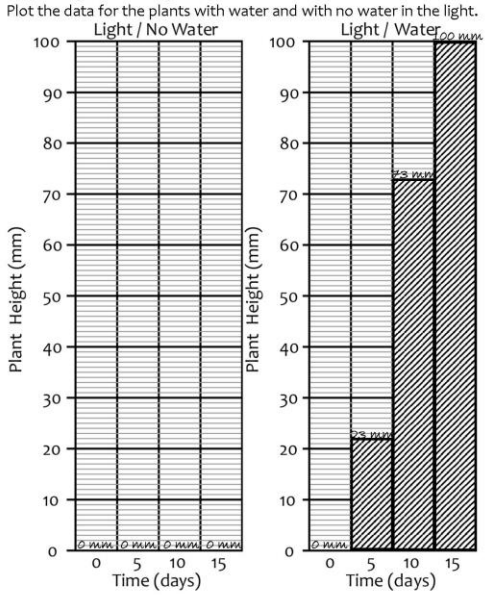
## Experimental Data

| Day | Light No Water |
|---|---|
| Day 0 | 0 mm |
| Day 5 | 0 mm |
| Day 10 | 0 mm |
| Day 15 | 0 mm |

| Day | Light Water |
|---|---|
| Day 0 | 0 mm |
| Day 5 | 23 mm |
| Day 10 | 73 mm |
| Day 15 | 100 mm |

5

2. Do plants grow in the light?
Plot the data for the plants with water and with no water in the light.



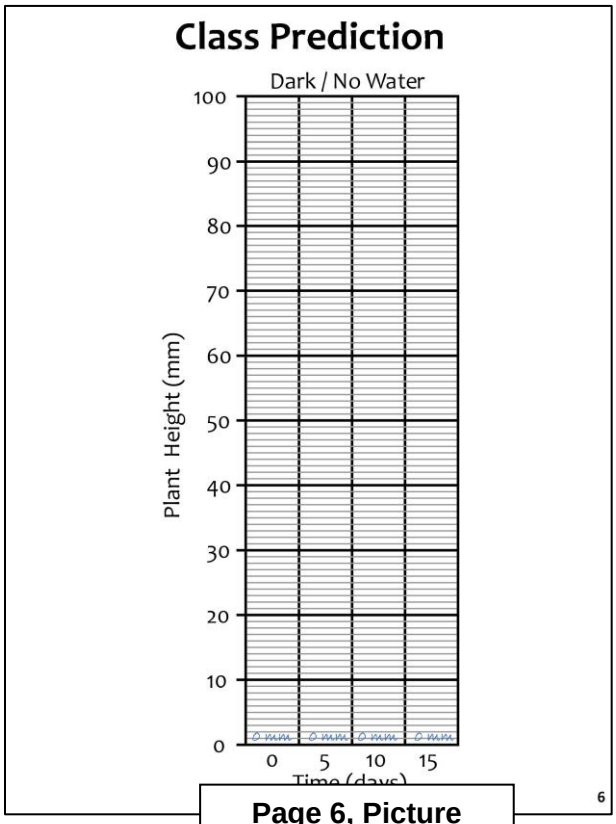

3. What did plants in the light need to grow? water

9

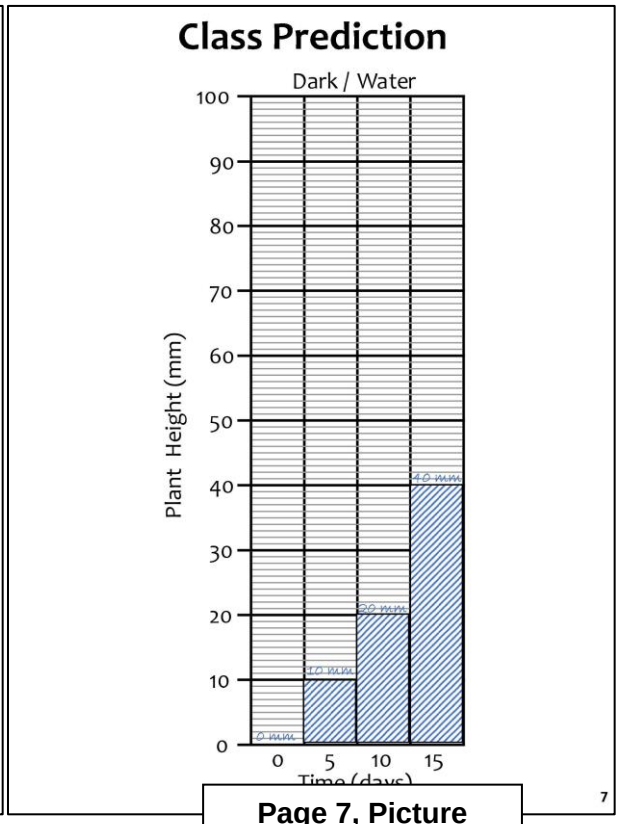
**Page 5, Picture Packet**

*Plants in the Dark Prediction: (6 minutes)*

- Have students predict what they think will happen to the plant height, if a seed is planted in the dark, with no water, and left there for 15 days.
- Record student ideas on the class prediction graph (page 6, picture packet).
- Have students predict what they think will happen to the plant height, if a seed is planted in the dark, with water, and left there for 15 days.
- Record student ideas on the class prediction graph (page 7, picture packet).




**Page 6, Picture Packet**




**Page 7, Picture Packet**

*Effect of Darkness and Water on Plant Growth: (7 minutes)*

- Have students graph what happened to a seed in the dark, with no water, over the course of 15 days (page 8, picture packet).
    - As students are graphing the data, graph the data on the class notebook off to the side, so that students can compare their graphs to your graph.
- Compare class the predictions to the actual data.
- Have students graph what happened to a seed in the dark, with water, over the course of 15 days (page 8, picture packet).
- Reveal the points one by one, but give students approximately 30 seconds to try to graph the point on their own before moving to the next point.
- Compare the class predictions to the actual data.
- Ask the students, "What did plants in the dark need to grow?"
    - Water
- Ask the students "Why do you think the plant in the dark with water grew taller, and faster, than the plant in the light with water?"

## Experimental Data

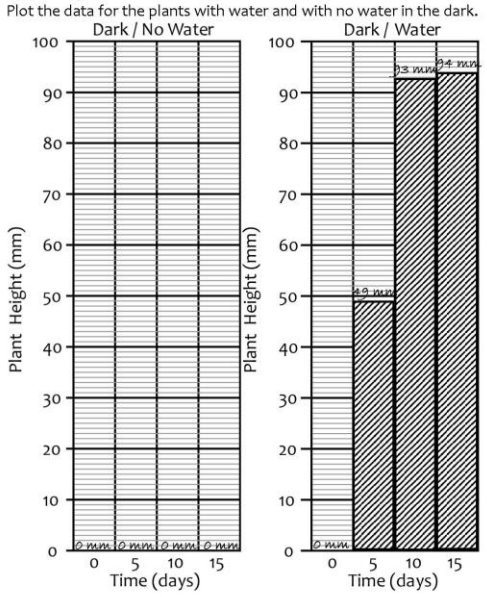
| Day | Dark No Water |
|---|---|
| Day 0 | 0 mm |
| Day 5 | 0 mm |
| Day 10 | 0 mm |
| Day 15 | 0 mm |

| Day | Dark Water |
|---|---|
| Day 0 | 0 mm |
| Day 5 | 49 mm |
| Day 10 | 93 mm |
| Day 15 | 94 mm |

**Page 8, Picture Packet**

8

4. Do plants grow in the dark?
Plot the data for the plants with water and with no water in the dark.

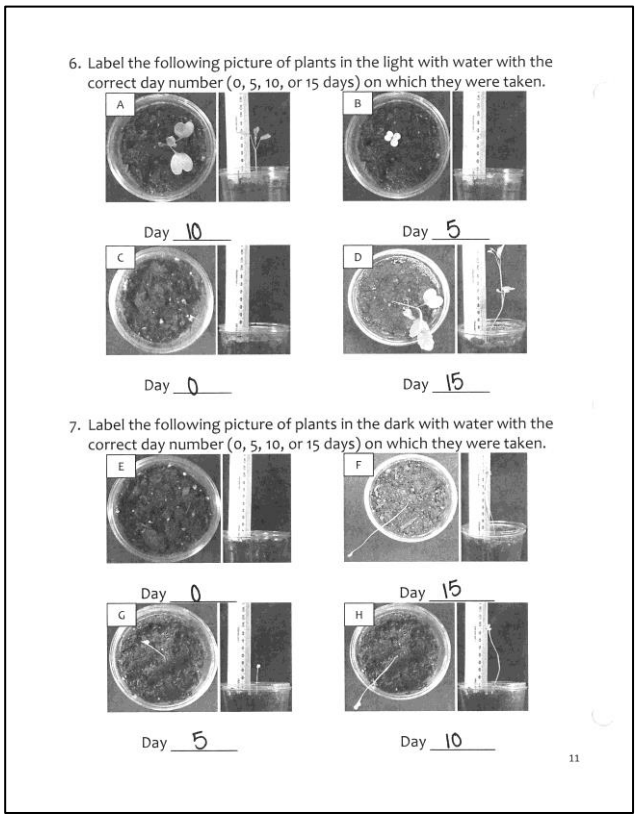



5. What did plants in the dark need to grow? water

10

*Matching Plant Growth Pictures: (4 minutes)*

- Have students look at the colored pictures of plant growth in the light (page 9, picture packet), and have students identify which picture matches with each day.
- Have students look at the colored pictures of plant growth in the dark (page 10, picture packet), and have students identify which picture matches with each day.
- Ask students how the appearance of plants differed when they were in the light, and in the dark.

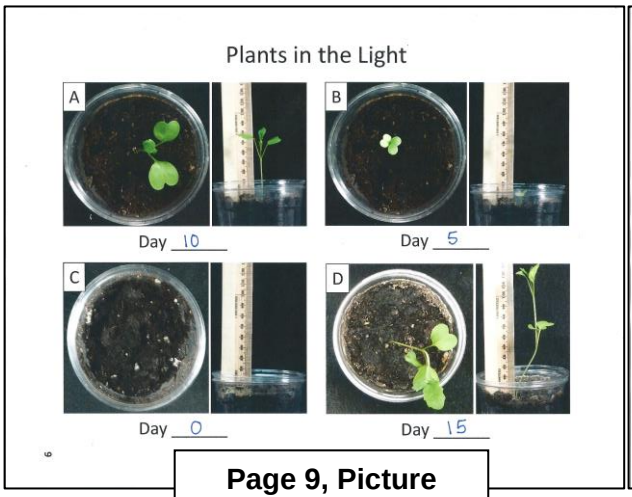

6. Label the following picture of plants in the light with water with the correct day number (0, 5, 10, or 15 days) on which they were taken.

A — Day 10
B — Day 5
C — Day 0
D — Day 15

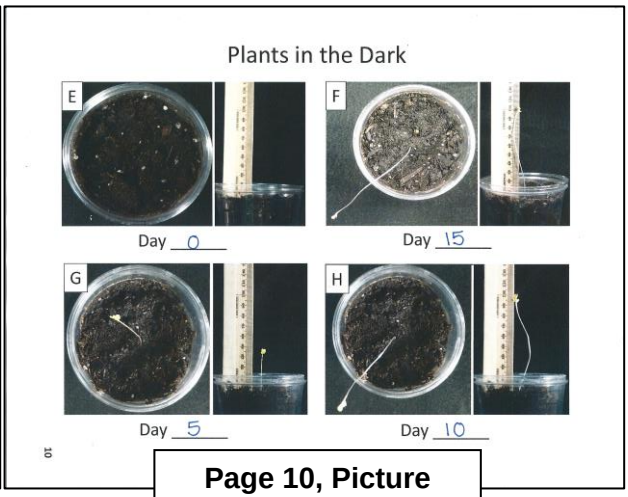
7. Label the following picture of plants in the dark with water with the correct day number (0, 5, 10, or 15 days) on which they were taken.

E — Day 0
F — Day 15
G — Day 5
H — Day 10

11



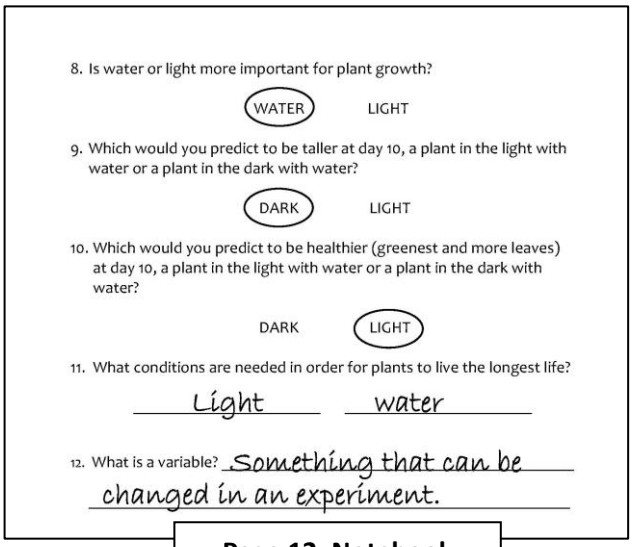

**Page 9, Picture Packet**




**Page 10, Picture Packet**

*Ideal Conditions for Plant Growth: (3 minutes)*

- Discuss question *8*: Is water or light more important for plant growth?
    - Water
- Discuss question *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
- Discuss question *10*: Which would you predict to be healthier (greener and more leaves) at day *10*, a plant in the light with water, or a plant in the dark with water?
    - Light
- Ask students, "What conditions are needed in order for plants to live the longest life?"
    - Water
    - Light


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?

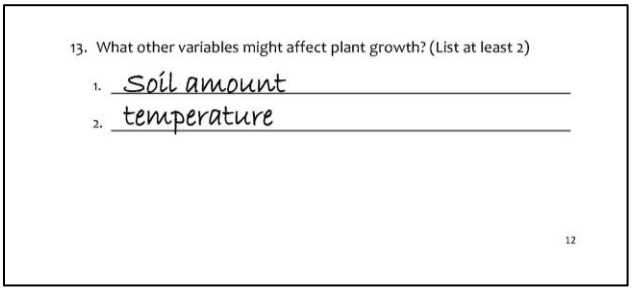
Light water

12. What is a variable? Something that can be changed in an experiment.

**Page 12, Notebook**

*Variables: (Time Permitting; make sure to leave 10 minutes for content assessment)*

- ONLY DO THIS SECTION IF THERE IS TIME.
- Review the definition of a variable with the class.
    - Something that you can change in an experiment.
- Have students brainstorm other variables (that were not tested) that might affect plant growth.
    - Temperature
    - Size of container
    - Type of plant


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

1. Soil amount
2. temperature

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***Content Assessment:*** *(10 minutes – Full Class – SciTrek Lead)*

- Pass out the content assessments and rulers.
- Read each question to students.
- Collect rulers as soon as students answer question *1*.
- Collect content assessments.

***Extra Practice Solutions:***

**EXTRA PRACTICE**

***Observations***

Observation: A description using your 5 senses

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* |

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