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. You can find the complete instructions at http://www.chem.ucsb.edu/scitrek/module. This document is intended to be used as a reference during the module.

Important Things to Remember During the Module

1. You are responsible for keeping track of time in the classroom and making sure that 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.

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

Schedule: You are responsible for BOLD sections

- 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. If the classroom has a document camera, ask the teacher to use it for the observation activity (page 1, picture packet and page 2, student notebook).
2. Write the four group colors on the board (purple, orange, blue, and green) and the name(s) of the volunteer(s) that will be working with each group.
3. Make sure that volunteers are setting up for the initial observation. Details of how to do this are in the volunteer instructions in the volunteer boxes.
4. 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 other materials (large cup, small cup with hole, ruler, and cloth strip).
Observations
Description of things using:
- Sight
- Touch
- Hearing
- Smell
- Taste

Observation: A description using your 5 senses

Scientific Practices
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
2. The object is made out of metal. Observation
3. The object is hotter than boiling water. Observation
4. The object is simple. Observation
5. The object has a pointed end. Observation
6. The object can be twisted at one end. Observation
7. The object has been used to write many words. Observation

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

Observations

Observation:
- potting soil
- water is dirty
- soil is damp

Observations

Observation:
- vermiculite
- water is clear
- soil is damp
- least amount of water in large cup
- soil absorbed the most water

Observation:
- rocks
- water is clear
- soil is dry
- most amount of water in large cup
- soil absorbed the least water

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

- Introduce the module/SciTrek volunteers.

**Observation Assessment:** (5 minutes – Full Class – SciTrek Lead)

- Pass out assessments and cotton balls.
- Read each statement and have students circle if the statement is an observation/not an observation.
- Collect assessments and cotton balls.
**Observation Activity:** (12 minutes – Full Class – SciTrek Lead)

- Have volunteers pass out notebooks.
- Have students fill out the front cover of their notebook.
- Tell students we will be working to answer the question, “What variables affect plant growth?”
- Put page 1 of the picture packet under the document camera.
- Have students help you fill in the table with what 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 with the students at the top of page 2 of their notebooks.
- Read the directions (page 2, student notebook).
- For each statement read each statement give student ~15 second to circle if the statement is an observations or not an observations about the object (mechanical pencil). Then go over the statement and have students box the correct answer.
- Review each statement and box the correct answer.
  - 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 this in their notebook).
  - For statements that are not observations, have students identify why. Write why the statement is not an observation in the margins of the class notebook (students do not have to write this in their notebook).
  - **Number 1:** The object is smaller than a jump rope.
    Observation – With Sense (Comparison)
    Sense: Sight
  - **Number 2:** The object is made out of metal.
    Not an Observation – False with Sight
    Incorrect observation
  - **Number 3:** The object is hotter than boiling water.
    Not an Observation – False with Sense (Comparison)
    Sense: Touch
  - **Number 4:** The object is simple.
    Not an Observation – Opinion
    Opinion
  - **Number 5:** The object has a pointed end.
    Observation – With Sight
    Sense: Sight
  - **Number 6:** The object can be twisted at one end.
    Observation – With Sense (Need to Test)
    Note: If you have twisted the end, then the statement is an observation. If you have not tested it then the statement is not an observation, it is an inference. Make sure that all students twist the end of the object to make this statement an observation.
    Sense: Touch
  - **Number 7:** The object has been used to write many words.
    Not an Observation – Inference
    Inference
- Have volunteers collect mechanical pencils.
**Observation Discussion:** (7 minutes – Full Class – SciTrek Lead)

- Review class question, “What variables affect plant growth?”
- Have students generate ideas on things that affect plant growth. Make sure one of their ideas is soil type.
- Tell students that we will first explore how soil type affects plant growth.
- Show students how plants were made:
  - Feed 5 cm x 15 cm towel through hole so 4 cm are sticking inside cup.
  - Put two cups of vermiculite (make sure that you use the word vermiculite with students) into the small cup (cup with towel stuck in hole).
  - Put 1 seed into the vermiculite
  - Place the small cup into the large cup
  - Pour 200 mL of water over the vermiculite and the seed.
  - Set the cup under light.
- Have students move to their groups.
  - If a student does not have a nametag, identify the group 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:** (16 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that 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 (just made plants) and 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 (7 day old plants).

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

- Have groups share what they did/learned.
  - The cups contained potting soil, vermiculite, and rock,
  - 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 rocks.
- Discuss how soil type relates to plant growth.
- Review how this finding would help someone that wants to plant a garden.
- Tell students that they will now pick a variable to explore.
- Go over the options for variables that students can change: light amount (show polarizing filters), liquid amount (they will use special larger graduated cylinders), nutrient amount (sugar, salt, or fertilizer).

**Question:** (9 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Encourage groups to pick different changing variables.
- After students pick their changing variable, students should explain to their volunteer how they think changing this variable will affect plant growth.

**Materials Page:** (4 minutes – Groups – SciTrek Volunteers)

- Give groups that are changing the water amount a 250 mL graduated cylinder and groups that are changing the nutrient type a 100 mL graduated cylinder.
- Walk around and help groups that are struggling.
- Make sure groups fill out the materials page correctly and completely.
Wrap-Up: (2 minutes – Full Class – SciTrek Lead)

- Tell students what they will do next time.

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

Schedule: You are responsible for BOLD sections

- 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. If the classroom has a document camera, ask the teacher to use it for the technique discussion (page 4, student notebook).
2. Set-up the light level boxes (0-4) if needed, in ascending order with the light turned on sitting on top of the boxes with the front lids removed.
3. Set-up an additional lamp for level 5 lighting, note this will not be in a box.
4. Remind the teacher that it is important that the lights are left on until the next SciTrek visit.
5. Do not plug extension cords into other extension cords.
6. Have volunteers set out the notebooks.
   a. If students are not in the classroom before SciTrek starts, have volunteers set out the notebooks where students should sit when they come into the classroom.
   b. If students are in the classroom before SciTrek starts, have volunteers pass out the notebooks and a ruler to students in their regular seats. Students will move into their groups after the technique discussion.
**Notebook Pages and Notepad Pages:**

**TECHNIQUE**

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 a pink pearl]
   - Height: 24 mm
   - Width: 78 mm

2. [Image of a pencil]
   - Height: 11 mm
   - Width: 41 mm

3. [Image of a calculator]
   - Height: 51 mm
   - Width: 45 mm

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**EXPERIMENTAL SET-UP**

**Changing Variable:** light amount

**Controls (variables you will hold constant):**
- Seed Type / Fast Plant
- Soil type / potting soil
- Liquid amount / 100 mL
- Time / 3 days

**Procedure**

2. Pour 100 mL of water on each plant and no nutrients.
3. Put plants under light A1, B1, C1, D1, and E1 light.
4. Wait 3 days.
5. Measure plant height and subtract to find how much the plant grew.

*If changing variable is nutrient amount step 2 example: Put A) 25 mL, B) 50 mL, C) 40 mL, D) 15 mL and E) 5 mL of sugar into the graduated cylinder then add water to 100 mL and pour over plant.*
Introduction: (2 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers pass out student notebooks and rulers.
- Review the class question with students and what they learned the last SciTrek visit.
- Ask students how we will know if a value of a variable, such as soil type, is “better” than another value.
  - Make sure that students come up with the idea of comparing plant heights.

Technique: (10 minutes – Full Class – SciTrek Lead)

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

Experimental Set-Up: (7 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure volunteers are reviewing the group question that the students picked the previous meeting.
- Make sure that all control blanks are filled out.

Procedure: (19 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure procedures are not too long but include all values of the changing variable, controls, and what data will be collected.
- Volunteers should be writing one step and having students copy that step before moving on to the next step.
**Results Table:** (5 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that control values are written in trial A with an arrow through the rest of the trials and that changing variable values are written in each trials box.

**Experiment:** (15 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that groups are recording their initial plant heights in the group notepad and in the student 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.
  - 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 then add 50 mL of water making the total liquid amount 75 mL.
- Make sure that groups are putting their plants under the correct amount of light.

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

- Tell students what they will do next time.

**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. Remove the plants from the boxes and have them ready to pass out to groups.
2. Turn off lights.
3. Stack boxes and put lamps in bags to bring back to UCSB. (Can be done after the module.)
4. Have volunteers set out the notebooks.
   a. If students are not in the classroom before SciTrek starts, have volunteers set out the notebooks where students should sit when they come into the classroom.
   b. If students are in the classroom before SciTrek starts, have volunteers set out the notebooks where they want students to sit and students will move to these spots after the introduction.
Notebook Pages and Notepad Pages:

**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 a line through each box to indicate 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>Seed Type</td>
<td>Seed Plant</td>
<td>Soil Type</td>
<td>Potting Soil</td>
<td>Liquid Amount</td>
<td>100 mL</td>
</tr>
<tr>
<td>Nutrient Type</td>
<td>no nutrients</td>
<td>Nutrient Amount</td>
<td>no nutrients</td>
<td>time</td>
<td>3 days</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>1 mm</td>
<td>11 mm</td>
<td>8 mm</td>
<td>10 mm</td>
<td>16 mm</td>
</tr>
<tr>
<td>Feal Plant Height</td>
<td>30 mm</td>
<td>41 mm</td>
<td>41 mm</td>
<td>31 mm</td>
<td>23 mm</td>
</tr>
<tr>
<td>Change in Plant Height</td>
<td>23 mm</td>
<td>30 mm</td>
<td>31 mm</td>
<td>23 mm</td>
<td>18 mm</td>
</tr>
<tr>
<td>Other Observations</td>
<td>tall and strong leaves</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The independent variable is the changing variable and the dependent variable is the final observations/measurement.

**RESULTS Graph and Summary**

My experiment shows plants in the dark grew taller than plants in the light because the plant in no light (level 0) grew 39 mm and the plant in full light (level 5) only grew 13 mm.
Introduction: (2 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers set out notebooks.
- Review class question and what they did last time.
- Tell them that they will be measuring their plants and then graphing their data.
- If needed have students move to their notebooks.

Experiment: (30 minutes – Groups – SciTrek Volunteers)

- Help pass out plants to the correct groups.
- Walk around and help groups that are struggling.
- All measurements will be recorded in the group 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 that are changing nutrient amount and using salt or sugar. Some of these plants might shrink. Even if a plant shrunk, have volunteers help students find the difference between the plant heights and put a star next to the value.

Graph: (10 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that students are graphing their trial on the individual graph piece with the value of the changing variable written underneath, not the trial letter.
  - If a plant shrunk, have students put a star above that data point on the individual graph piece.
- 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 the values, have students put the starred values (plants that shrunk) before they put the values for plants that grew.
- Make sure students are labeling their axes and writing the change in plant height on top of each column.
**Results Summary:** (16 minutes – Groups – SciTrek Volunteers)

- Walk around and help groups that are struggling.
- Make sure that groups are generating a claim (ideally the claim will allow them to make a prediction about future experiments) and using data to back it up.
- Volunteers struggle with results summaries, so try to check each group’s summary.
- Have students fill out the sentence frame on page 8, “I acted like a scientist when _____”

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

- Tell the students what they will be doing next time.

**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. Ask the classroom teacher for a place to leave the student posters.
2. Have volunteers set out notebooks.
   a. If students are not in the classroom before SciTrek starts, have volunteers set out the notebooks where students should sit when they come into the classroom.
   b. If students are in the classroom before SciTrek starts, have volunteers set out the notebooks where they want students to sit and students will move to these spots after the introduction.

**Poster and Highlighted/Numbered Notebooks:**
Introduction: (2 minutes – Full Class – SciTrek Lead)

- If needed have volunteers set out notebooks.
- Review the class question and what they did last time.
- Tell students that today they will describe their experiment to their volunteer and then make a poster.
- If needed have students move to their notebooks.

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 make them have to come up with predictions based on their data.

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

- Help volunteers glue poster pieces onto the poster. When gluing, make sure that the volunteers are gluing the poster in the exact order that is shown on the diagram and that the poster has a landscape orientation.
- Make sure that 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.
- Each student should have the part(s) that 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 above).

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

- Ask students the following questions:
  o How did you act like a scientist during this project?
  o 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. If the classroom has a document camera, ask the teacher to use it for the notes on presentations (page 2, picture packet). If there is no document camera write the class question on the board.
2. Give the teacher the “Evaluation of the SciTrek Program by Participating Teachers” form. Ask teachers to fill this form out and give it back to you the next time you are there.
3. Organize posters so that experiments featuring the same changing variable will be presented back to back.
4. Have volunteers pass out notebooks.

**Picture Packet Page:**

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

- If needed have SciTrek volunteers pass out notebooks.
- Tell students that they will have 15 minutes to discuss their experiment and practice their posters.
- DO NOT GIVE STUDENTS MORE THAN 15 MINUTES OR YOU WILL RUN OUT OF TIME FOR POSTERS.
Practice Posters: (15 minutes – Groups – SciTrek Volunteers)

- Organize posters so that experiments featuring the same changing variable are presented back to back.
- Make sure that volunteers are having students explain their experiment and asking them questions that make them generate predictions based on their data.
- Make sure students are reading from their notebook 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 data on page 2 of the picture packet.
  - When a group reads their question, record the changing variable.
  - Stop the presentation after the question and have the class identify the changing variable.
  - When a group reads their graph, record the values of the changing variable and their measurements.
- After each presentation ask students:
  - What questions do you have for this group?
  - Can someone summarize what we learned from this group?
- Record what they learned under the summary on page 2 of the picture packet.
- After all presentations are over, have students tell you the variable values that would allow a plant to grow as tall as possible.

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

- Tell the students that the volunteers that have been working with them are undergraduate and graduate students that volunteer their time so that they can do experiments. Have the students say thank you to the volunteers. This is the last day with their SciTrek volunteers, therefore, they should say goodbye to them.
- Tell students to remove the paper part of their nametag from the plastic holder and that they can keep the paper nametag but need to give the plastic holder back to their SciTrek volunteer.

Day 6: Observation Assessment/Tie to Standards/Content Assessment

Schedule: You are responsible for BOLD sections

Observation Assessment (SciTrek Lead) – 10 minutes
Tie to Standards (SciTrek Lead) – 40 minutes
Content Assessment (SciTrek Lead) – 10 minutes

Preparation:

1. Collect the “Evaluation of the SciTrek Program by Participating Teachers” form and lab coat from the teacher.
2. If the classroom has a document camera, ask the teacher to use it for the tie to standards activity with students (pages 8-12, student notebook) and tie to standards pictures (pages 3-10, picture packet).
3. Pass out the observation assessments and notebooks.
4. Remind the teacher to give you their lab coat at the end of the day.
I acted like a scientist when I measured the height of the plant in mm.

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>Crate</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>ppm</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 do plants in the light need to grow? Water

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.

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

- Pass out assessments and black beads.
- Read each statement and have students circle if the statement is an observation/not an observation.
- Collect black beads.
- Have students turn over the page and answer the 3 attitudes towards science questions.
- Collect Assessments.
- Pass out the draw a scientist papers and have students take **exactly 4 minutes** to draw a scientist.

**Tie to Standards:** (40 minutes – Full Class – SciTrek Lead)

**Plant Growth Predictability:** (5 minutes)

- Ask students if plant growth is 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.

**Plants in the Light Prediction:** (8 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).
Effect of Light and Water on Plant Growth: (9 minutes)

- As a class, graph together 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 that you do not want students to see]).
- Compare class predictions to actual data.
- As a class, graph together what happened to a seed in the light with water over the course of 15 days (page 5, picture packet).
- Compare class predictions to actual data.
- Ask the students, “What did plants in the light need to grow?”
  - Water

Plants in the Dark Prediction: (4 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).

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 so that students can compare their graphs to your graph.
- Compare class predictions to 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 ~30 seconds to try and graph the point on their own before moving to the next point.
- Compare class predictions to 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?”

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 what 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 what day.
- Ask students how the appearance of plants differs when they were in the light and in the dark.

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?
  o 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?
  o Light
• Ask students: What conditions are need in order for plants to live the longest life?
  o Water
  o Light

Variables: (Time Permitting)

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

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

• Pass out 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](image)