Lead Information Packet
Module 1: Soil Water Retention
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](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/Technique/Observation Activity/Observations

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

- **Introduction (SciTrek Lead)** – 2 minutes
- **Observation Assessment (SciTrek Lead)** – 5 minutes
- **Module Introduction (SciTrek Lead)** – 5 minutes
- **Technique (SciTrek Lead)** – 10 minutes
- **Observation Activity (SciTrek Lead)** – 13 minutes
- **Observations (SciTrek Volunteers)** – 20 minutes
- **Wrap-Up (SciTrek Lead)** – 5 minutes

**Preparation:**

1. If the classroom has a document camera, ask the teacher to use it for the introduction (page 1, picture packet), technique discussion (page 2, student notebook) and the observation activity (page 2, picture packet and page 3, 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 on a picture in the volunteer boxes.
**Notebook Pages, Notepad Pages, and Picture Packet Pages:**

**Observations**
Description of things using:
- **Sight**
- **touch**
- **hearing**
- **smell**
- **taste**

**Not Observations**
- **Inferences**
- **Opinions**
- **Incorrect Observations**

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

---

**Technique**

**Graduated Cylinders**

Graduated cylinders are used to measure volume of liquids.

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

**How much water is in each graduated cylinder?**

<table>
<thead>
<tr>
<th>Cylinder</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>88 mL</td>
</tr>
<tr>
<td>B</td>
<td>45 mL</td>
</tr>
<tr>
<td>C</td>
<td>74 mL</td>
</tr>
<tr>
<td>D</td>
<td>29 mL</td>
</tr>
</tbody>
</table>

---

**Scientific Practices**

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

- Introduce the module/SciTrek volunteers.

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

- Pass out assessments and paper clip.
- Read each statement and have students circle if the statement is an observation/not an observation.
- Collect assessments and paper clips.

Module Introduction: (5 minutes – Full Class – SciTrek Lead)

- Show students the picture of the landslide (page 1, picture packet) and ask them what happened.
- Ask students what are things (variables) that might affect if a landslide happens?
- Tell students that most of the variables that cause landslides involve water and soil.
- Tell students we will be working to answer the question, “What variables affect how much liquid a soil can absorb?”
- Have volunteers pass out notebooks.
- Have students fill out the front cover of their notebook.

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

- Show students the 500 mL graduated cylinder and explain what graduated cylinders are and how to use them.
- Read the directions on page 2 of the student notebook and answer the first question as a class.
- Have students complete the other three questions individually.
- Review each question.

Observation Activity: (13 minutes – Full Class – SciTrek Lead)

- Put page 2 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 observation categories.
• Have volunteers pass out bendy straws.
• Fill in the definition for observation with the students at the top of page 3 of their notebooks.
• Read the directions (page 3, student notebook).
• As a class, go over each statement and circle the correct answer. In addition:
  o 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).
  o 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 lighter than a bowling ball.  
    Observation – With Sense (Comparison)  
    Sense: Touch
  ▪ **Number 2:** The object is only one color.  
    Not an Observation – False with Sight  
    Incorrect observation
  ▪ **Number 3:** The object is thicker than a broom handle.  
    Not an Observation – False with Sight (Comparison)  
    Incorrect observation
  ▪ **Number 4:** The object is silly.  
    Not an Observation – Opinion  
    Opinion
  ▪ **Number 5:** The object has lines.  
    Observation – With Sight  
    Sense: Sight
  ▪ **Number 6:** The object can be bent so both ends touch.  
    Observation – With Sense (Need to Test)  
    Note: If you have bent the straw so both ends touch, 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 bend the object so that both ends touch to make this statement an observation.  
    Sense: Touch and sight
  ▪ **Number 7:** The object came from the grocery store.  
    Not an Observation – Inference  
    Inference

• Have volunteers collect bendy straws
• Have students move to their groups.
  o 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:** (20 minutes – Groups – SciTrek Volunteers)

• Walk around and help groups that are struggling.
• Make sure that groups are moving along and only spending ~6 minutes on the observations of the experimental set-up and then ~14 minutes describing what happens when water is poured over the loose soil (cup A) and the compacted soil (cup B).
Wrap-Up: (5 minutes – Full Class – SciTrek Lead)

- Have groups share what they did/learned.
  - Water was poured over both loose and compacted soil. The water went through the loose soil faster than the compacted soil. Both soils absorbed about the same amount of water.
- Discuss how soil compactness relates to soil absorption and to landslides.

Day 2: Question/Materials Page/Experimental Set-Up/Procedure/Results Table

Schedule: You are responsible for BOLD sections

- Introduction (SciTrek Lead) – 7 minutes
- Question (SciTrek Volunteers) – 10 minutes
- Materials Page (SciTrek Volunteers) – 5 minutes
- Experimental Set-Up (SciTrek Volunteers) – 5 minutes
- Procedure (SciTrek Volunteers) – 20 minutes
- Results Table (SciTrek Volunteers) – 5 minutes
- Wrap-Up (SciTrek Lead) – 8 minutes

Preparation:

1. If the classroom has a document camera, ask the teacher to use it for the wrap-up (page 3, picture packet).
2. Have the 250 mL graduated cylinder, scale, and the vermiculite available to show students during the introduction.
3. 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.
Notebook Pages, Notepad Pages, and Picture Packet Page:

<table>
<thead>
<tr>
<th>Factors</th>
<th>Changing Variable</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Soil Amount</td>
<td>Liquid Amount (ml)</td>
</tr>
<tr>
<td></td>
<td>Soil Type</td>
<td>Liquid Amount (ml)</td>
</tr>
<tr>
<td>Liquid</td>
<td>Liquid Amount</td>
<td>Liquid Thickness (mm)</td>
</tr>
<tr>
<td></td>
<td>Liquid Thickness</td>
<td>Liquid Amount (ml)</td>
</tr>
</tbody>
</table>

**QUESTION**

Question our group will investigate:
- If we change the **liquid amount**, what will happen to the **soil amount** that the soil absorbs?

**EXPERIMENTAL SET-UP**

Changing Variable: **liquid amount**

Controls (variables you will hold constant):
- **Cup Material**: soil amount 2 small cups
- **Soil Material**: potting soil
- **Soil Type**: potting soil
- **Liquid Thickness**: thin level

PROCEDURE:
1. Fill each cup with 2 small cups of potting soil.
2. Pour 50mL, 100mL, 150mL, 200mL, 250mL of thin liquid through cups.
3. Use a graduated cylinder to measure the amount of water that came out.
4. Subtract to find the water absorbed.

**EXPERIMENTAL SET-UP**

Changing Variable: **liquid amount**

Controls (variables you will hold constant):
- **Cup Material**: soil amount 2 small cups
- **Soil Material**: potting soil
- **Soil Type**: potting soil
- **Liquid Thickness**: thin level

PROCEDURE:
1. Fill each cup with 2 small cups of potting soil.
2. Pour 50mL, 100mL, 150mL, 200mL, 250mL of thin liquid through cups.
3. Use a graduated cylinder to measure the amount of water that came out.
4. Subtract to find the water absorbed.
**Introduction:** (7 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers set out notebooks.
- Review the class question and what they learned last SciTrek visit.
- Tell students they will now get to pick a variable to explore.
• Go over the options for variables that students can change: liquid thickness (only variable that does not get to choose soil type), liquid amount (they will use special larger graduated cylinder), soil amount (they will use a scale to measure soil amount), soil type (show vermiculite they get to pick from soils that no other groups can use).
  o Make sure to down play liquid thickness.
  o Explain that thick liquids can be snow, hail, mud, etc.
• If needed have students move to their notebook.

**Question: (10 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 that variable will affect the amount of liquid that the soil will absorb.

**Materials Page: (5 minutes – Groups – SciTrek Volunteers)**

• Give groups doing liquid amount a large graduated cylinder to help them pick the liquid amounts. Volunteers can write on the graduated cylinder with the wet erase pens.
• Walk around and help groups that are struggling.
• Make sure groups fill out the materials page correctly and completely.

**Experimental Set-Up: (5 minutes – Groups – SciTrek Volunteers)**

• Walk around and help groups that are struggling.
• Make sure that all control blanks are filled out.

**Procedure: (20 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.
• Have groups that finish early work on the extra practice on page 13 of their notebook.

**Wrap-Up: (8 minutes – Full Class – SciTrek Lead)**

• Have one student from each group share the question that they will investigate.
• Go over page 3 of the picture packet and have students identify which soil absorbed more liquid.
• Pick numbers to show how to calculate the amount of liquid absorbed.
• If there is extra time do the extra practice on page 13 of the student notebook as a class.
• Tell students what they will do next time.
Day 3: Experiment/Graph/Results Summary

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

- **Introduction (SciTrek Lead) – 5 minutes**
- **Experiment (SciTrek Volunteers) – 27 minutes**
- **Graph (SciTrek Volunteers) – 10 minutes**
- **Results Summary (SciTrek Volunteers) – 16 minutes**
- **Wrap-Up (SciTrek Lead) – 2 minutes**

Preparation:

1. If the classroom has a document camera, ask the teacher to use it for the introduction (page 4, picture packet).
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 as they come into the class.
   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.

Notepad Pages, Notebook Pages, and Picture Packet Page:
Introduction: (5 minutes – Full Class – SciTrek Lead)

- If needed have SciTrek volunteers set out notebooks.
- Review class question and what they did last time.
- Explain how to use a graduated cylinder.
• Use the example cup (page 4, picture packet) and have students explain what they will do in their experiment while you draw each step.
• Use subtraction to determine how much water the soil absorbed.
• If needed have students move to their notebooks.

**Experiment: (27 minutes – Groups – SciTrek Volunteers)**

• Walk around and help groups that are struggling.
• Volunteers can write on the graduated cylinder with the wet erase pens.
• All measurements will be recorded in the group notepad and subtraction will be done on the notepad. Students only need to record the amount in the large cup and the amount absorbed in their notebooks.

**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.
• Make sure volunteers are having students arrange the individual graph pieces in increasing order by amount of liquid absorbed and then taping them onto the group notepad.
• Make sure students are labeling their axes and writing the liquid absorbed 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:**

A larger version of poster is in your group box.

---

**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 5, picture packet). If there is no document camera write the class question on the board.
2. Organize posters so that experiments featuring the same changing variable will be presented back to back.
3. Have volunteers pass out notebooks.

Picture Packet Page:

<table>
<thead>
<tr>
<th>Group 1 (3 cups potting soil)</th>
<th>Charging Variable</th>
<th>Liquid Amount (mL)</th>
<th>Liquid Absorbed (mL)</th>
<th>Summary:</th>
<th>What variables affect how much liquid a soil can absorb?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>liquid</td>
<td>30</td>
<td>60</td>
<td>75</td>
<td>The more water the more the soil absorbs until it reaches a maximum value</td>
</tr>
<tr>
<td></td>
<td>amount</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>150</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>150</td>
<td>180</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 2 (3 cups potting soil)</th>
<th>Charging Variable</th>
<th>Liquid Amount (mL)</th>
<th>Liquid Absorbed (mL)</th>
<th>Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>liquid</td>
<td>30</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>amount</td>
<td>100</td>
<td>140</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td></td>
<td>110</td>
<td>114</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td></td>
<td>110</td>
<td>114</td>
<td>114</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3</th>
<th>Charging Variable</th>
<th>Liquid Thickness</th>
<th>Liquid Absorbed (mL)</th>
<th>Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>liquid</td>
<td>level 0</td>
<td>30</td>
<td>level</td>
</tr>
<tr>
<td></td>
<td>amount</td>
<td>level 1</td>
<td>63</td>
<td>level 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>level 2</td>
<td>72</td>
<td>level 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>level 3</td>
<td>87</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 4</th>
<th>Charging Variable</th>
<th>Soil Type</th>
<th>Liquid Absorbed (mL)</th>
<th>Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>liquid</td>
<td>29</td>
<td>large</td>
<td>the smaller the pieces the more water the soil absorbs</td>
</tr>
<tr>
<td></td>
<td>amount</td>
<td>43</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>69</td>
<td>small</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>76</td>
<td>sand</td>
<td></td>
</tr>
</tbody>
</table>
**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)

- Tell students that if they ask a scientific question (a question that helps summarize what the group did/learned) they will receive a SciTrek pencil after the presentations are done.
- Have students present their posters.
- While posters are being presented, record each group’s changing variable values and data on page 5 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 5 of the picture packet.
- After all presentations are over, have students tell you the variable values that would allow a soil to absorb as much liquid 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.
- Have volunteers give students SciTrek pencils.
- 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**

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

- Observation Assessment (SciTrek Lead) – 5 minutes
- Tie to Standards (SciTrek Lead) – 55 minutes
Preparation:

1. 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 6-11, picture packet).
2. Fill 4 graduated cylinders with 100 mL of water each.
3. Place a pre-cut coffee filter inside each of the four medium (9 oz) cups with holes.
4. Place the medium cups inside the large (20 oz) cups.
5. Pour three small (1 oz) cups (completely full and level) of each of the following soil types into the four cups with coffee filters: small rocks, large rocks, sand, and vermiculite.
6. Pass out the observation assessments and notebooks.
7. Remind the teacher to give you their lab coat at the end of the day.

Notebook Pages, Picture Packet Pages, and Findings Page:

[Image of notebook page with text and diagrams regarding soil types and liquid measurement]
Possible Factor 1: Liquid Amount (for 1 small cup of potting soil)

4. Is there a limit to the amount of water that soil can absorb?  **YES**

5. 1 small cup of potting soil can hold **15 mL** of water.

6. How much water can 2 cups of soil absorb? **50 mL**

7. Adding water to soil makes the soil **Lighter**

8. The **More** water in the soil the more likely a landslide.

Possible Factor 2: Soil Type

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

   2. Small Rocks
   1. Large Rocks
   3. Sand

10. **Particle Size** affects how much water a soil type can absorb.

11. Sand holds **Less** water than large rocks making wet sand **Lighter** than wet large rocks which results in wet sand having **More** landslides than wet large rocks.

12. **Material absorbency** affects how much water a soil type can absorb.

13. Vermiculite holds **Less** water than sand making wet vermiculite **Lighter** than wet sand which results in wet vermiculite having **More** landslides than wet sand.
Other Possible Factors:

14. Another factor that affects landslides is the **slope** of the soil.
15. Draw a picture where a landslide is more and less likely to happen.

16. The **Steeper** the slope the more likely a landslide.
17. Draw a picture of why plants help prevent landslides.

18. Another factor that affects landslides is the ability of soil to **stick to itself** (consistency).
19. The more plants the soil sticks to itself, the **stronger** the soil, the **more** consistent and the **less** likely a landslide.

Possible Ways to Prevent Landslides:

- What factor does this address? **Slope**
- What factor does this address? **Soil type/consistency**
*All findings should be covered so that they can be revealed one by one.

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

- Pass out assessments and rubber bands.
- Read each statement and have students circle if the statement is an observation/not an observation.
- Collect assessments and rubber bands.

**Tie to Standards:** (55 minutes – Full Class – SciTrek Lead)

**Review:** (7 minutes)

- Have students fill in the definition of absorb, question 1.
- Have students circle the soil that absorbed the most liquid.
- Discuss what this has to do with landslides and help students understand that the heavier the soil the more likely a landslide.
- Have students fill in question 3 and reveal finding 1.

**Possible Factor 1: Liquid Amount (15 minutes)**

- Have students look at the graph on page 9 of the notebook and tell them that the amount of water poured over the potting soil is shown on the x-axis and point to it.
- Ask students how much water was poured over trial 1 and draw the amount on the corresponding cup (page 6, picture packet).
- Tell students that the amount of water absorbed by the soil is shown on the y-axis and point to it.
- Ask students how much water was absorbed in trial 1 and draw the amount on the corresponding cup.
- Repeat for each trial, doing the necessary subtraction to find the amount that would be at the bottom of the big cup.
• Have students answer question 4 and 5.
• As a class discuss and fill out question 6 predicting how much liquid 2 cups of soil could absorb.
• Have students look at the picture on page 9 and show them the corresponding picture on page 7 of the picture packet and discuss why water is sitting on the top of the soil.
• Discuss how the more water the soil absorbs, the more it weighs and the more likely a landslide, then have students fill out question 7 and 8.
• Discuss how if it rains for a long period of time the soil will get saturated and then the soil will not take on any more water/mass.
• Show students Finding 2.

Possible Factor 2: Soil Type (13 minutes)

• If a group tested soil type ask the students to predict which of the soil types (small rocks, large rock, and sand) will be the least absorbent, which will be the most absorbent, and why. (If no group tested soil type do not have students make a prediction.)
• Have a volunteer help you pour 100 mL of water through each of the three soil types at the same time.
  o If needed show student page 8 of the picture packet showing the water that went through each of the three soils in graduated cylinders.
• Have students observe what happens and identify the trend that they see.
• Have students answer question 10.
• Discuss how this applies to landslides and answer question 11
• Have students look at the picture on page 10 of their notebook, show them the colored picture (page 9, picture packet) and have them compare the objects.
  o Students should notice that the objects are the same size.
  o Students should realize that if water was poured over the object they would absorb different amounts.
• Explain that this shows us another factor that affects the amount of water that a soil can absorb, material absorbency.
• Record material absorbency for question 12.
• Help students see that sand and all sizes of rocks have low material absorbance and vermiculite has a high material absorbance.
  o To prove this to students show students the sand and the vermiculite and ask them to compare the size of the particles.
  o Pour 100 mL of water over the vermiculite and have students compare the amount of water absorbed to the amount that sand absorbed.
• Have students answer question 13.
• Show finding 3.

Other Possible Factors (14 minutes)

• Tell students that there is one other major variable that can lead to landslides that they did not test in their experiments. Ask the students if they know this variable.
  o They should be able to come up with the slope of the hillside. If students have trouble coming up with this, ask them why they would not be worried about landslides occurring on the field at their school.
• Have students fill in slope for question 14.
• Have students draw a picture of a hill behind a house where it is likely for a landslide to happen and unlikely for a landslide to happen.
• Show finding 4.
• Show the students the picture of the hill with and without plants (page 10, picture packet).
• Ask the students which picture they think would be more likely to have a landslide and why. (The hill with no plants because the plants have roots that help the soil stick together.)
• Have students draw in roots on the plants showing why plants help prevent landslides for question 17.
• Tell student that scientists call the ability of a soil to stick to itself, soil consistency. The higher the soil consistency, the more the soil sticks together.
• Fill in “stick to itself (consistency)” for question 18.
• Have students fill in question 19.
• Show finding 5.

Possible Ways to Prevent Landslides (6 minutes)

• Review with students that they taught you that water amount, particle size, material absorbency, slope, and soil consistency are all factors that affect landslides.
• Tell students that engineers try to find ways to prevent landslides, two ways are shown on the picture on page 12 of their notebook and are also in color on page 10 of the picture packet.
• Have students look at the first picture on the bottom of page 10 and discuss.
• Ask students which factor this solution addressed and fill it in under the picture.
• Have students look at the second picture on the bottom of page 10 and discuss.
• Ask students which factor this solution addresses and fill it in under the picture.

Extra Practice Solutions: