

# Preparation Guide

## Level 4 Module 2

### Traits

## With Spotlight Lessons on Weather and Sky

**Materials:** This section lists the quantity of each material necessary for the lesson. Lesson materials may be from a *PhD Science*® materials kit or they may be school supplied. In addition to the listed materials, teachers should have access to the following common classroom items: sticky notes, chart paper, pencils, a whiteboard, and markers.

**Preparation:** This section identifies preparation teachers should complete before the lesson, including resources teachers should gather or cue. This section has two subsections:

- **Resources:** This subsection lists module resources (from Appendix A in the Teacher Edition) and core texts used in the lesson. Classrooms also need daily access to the module’s Teacher Edition, Science Logbooks, and, if applicable, PhD Projected. A symbol (☐) identifies resources that appear in PhD Projected.
- **Setup:** This subsection lists media teachers must cue before the lesson, activities that require setup, and items in the current lesson that are reused in future lessons. Note that items found in a typical elementary classroom (e.g., glue, tape, scissors) are not listed for reuse. This subsection also describes advance preparation for upcoming lessons. For example, if teachers need to prepare one day in advance for an activity in Lesson 11, an advance preparation note appears in the Setup subsection for Lesson 10. A symbol (🕒) identifies lessons with advance preparation notes.

## Advance Materials Preparation

Several activities in this module require advance preparation. A version of this list appears in the Module Overview of the Teacher Edition. The expanded version in this guide identifies all lessons for which preparation may take longer than a planning period. A symbol (†) identifies preparation that can be done earlier than the suggested time.






Lesson	Time in Advance	Investigation	Description
4	5–6 days†	Species Stations	Plant and prepare Wisconsin Fast Plants® for the species stations. (See Lesson 4 Resource A.)
13	1 day†	Science Challenge	Prepare Fast Plants for the science challenge. (See Lesson 13 Resource.)

## Spotlight Lessons on Weather and Sky



<b>Lesson</b>	<b>Time in Advance</b>	<b>Investigation</b>	<b>Description</b>
1	1 day	Plan to Collect Weather Data	Build the rain gauge. (See Lesson 1 Resource A.) Place the rain gauge in an uncovered, level area outside 1 day before the lesson.
5	4 days†	Observe Shadows and Identify Patterns	Prepare Shadows Throughout the Day Photographs (See Lesson 5 Resource.)

# Lesson Materials and Preparation




## Lesson 1

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tape measure, 30 m (1)</li> </ul>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Tape, masking (partial roll) or cones, plastic (5)</li> </ul>
<p><b>Preparation</b></p> 	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource A: Whale Photographs and Typical Adult Lengths</li> <li><input type="checkbox"/> Lesson 1 Resource B: “For Humpback Whales in Sanctuaries, Public Involvement Counts” (Wilken 2017) </li> <li><input type="checkbox"/> Lesson 1 Resource C: Four Whale Photographs </li> <li><input type="checkbox"/> <i>Here Come the Humpbacks!</i> by April Pulley Sayre (2013) </li> </ul> <hr/> <p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Identify a large, open area (such as a gym or sports field) to take students to during the Lesson 1 Launch. Before the lesson, use a tape measure to measure a length of 15 meters in this area and mark the start point and endpoint with pieces of masking tape or other objects (e.g., cones).</li> <li><input type="checkbox"/> Print a copy of Whale Photographs and Typical Adult Lengths. (See Lesson 1 Resource A.)</li> <li><input type="checkbox"/> Cue whale video 1 (<a href="http://phdsci.link/1267">http://phdsci.link/1267</a>), whale video 2 (<a href="http://phdsci.link/1268">http://phdsci.link/1268</a>), and whale video 3 (<a href="http://phdsci.link/1269">http://phdsci.link/1269</a>). </li> </ul> <p><b>Advance Preparation for Lesson 4</b></p> <p><b>5–6 Days Before:</b> Plant and prepare Wisconsin Fast Plants® for the species stations. (See Lesson 4 Resource A.)</p>	

## Lesson 2

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> <input type="checkbox"/> Classroom objects with noticeable differences (10)
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 1 Resource B: “For Humpback Whales in Sanctuaries, Public Involvement Counts”  <input type="checkbox"/> Lesson 2 Resource A: Whale Cards <input type="checkbox"/> Lesson 2 Resource B: Species Cards <input type="checkbox"/> <i>Here Come the Humpbacks!</i> 	
	<b>Setup</b> <input type="checkbox"/> Gather a set of at least 10 classroom objects that have noticeable similarities and differences; some of the objects should be the same kind but have small differences (e.g., two bottles of glue in different sizes or with different labels, two glue sticks in different sizes or colors, two paper clips made of different materials or in different sizes or colors, two rolls of tape made of different materials or in different colors, and two pairs of scissors in different sizes or colors). If enough materials are available, prepare a set of objects for each group. <input type="checkbox"/> Prepare whale cards. (See Lesson 2 Resource A.) <input type="checkbox"/> Prepare species cards. (See Lesson 2 Resource B.)  <b>Item Reuse</b> <input type="checkbox"/> Lesson 3 requires the prepared humpback whale characteristics diagram.	



### Lesson 3

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> <input type="checkbox"/> Photographs of six school staff members (or six famous people)
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Humpback whale characteristics diagram from Lesson 2 (1)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 3 Resource A: Suggestions for Discussing Human Traits, Growth and Development, and Inheritance <input type="checkbox"/> Lesson 3 Resource B: Humpback Whale Count Photographs  <input type="checkbox"/> Lesson 3 Resource C: Individual Humpback Whale Photographs  <input type="checkbox"/> Lesson 3 Resource D: Migaloo and Beluga Whale Photographs 	
	<b>Setup</b> <input type="checkbox"/> Select and print photographs of at least six school staff members (e.g., principal, other teachers, and coaches). Select one of these staff members to be the snack bringer. If school staff photographs are not available, use photographs of famous people instead. Label each photograph with the name of the person shown. <input type="checkbox"/> Print a copy of Humpback Whale Count Photographs for each student pair. (See Lesson 3 Resource B.)	




## Lesson 4

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Containers, clear plastic, round 8 oz (24)</li> <li><input type="checkbox"/> Containers, clear, plastic, round 16 oz (24)</li> <li><input type="checkbox"/> Fast Plant seed packets             <ul style="list-style-type: none"> <li><input type="checkbox"/> F1 Non-Purple Stem, Yellow-Green Leaf (1)</li> <li><input type="checkbox"/> Non-Purple Stem, Hairless (1)</li> <li><input type="checkbox"/> Yellow-Green Leaf (1)</li> </ul> </li> <li><input type="checkbox"/> Grow light, fluorescent (1)</li> <li><input type="checkbox"/> Magnifiers, handheld, plastic (6)</li> <li><input type="checkbox"/> Plant fertilizer pellets (1 lb)</li> <li><input type="checkbox"/> Plant label tags (24)</li> <li><input type="checkbox"/> Rope, braided cotton, 3.5 m (1)</li> <li><input type="checkbox"/> Shells, Peruvian scallop (18)</li> </ul>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Computers or tablets with internet access (6)</li> <li><input type="checkbox"/> Knife, precision (1)</li> <li><input type="checkbox"/> Marker, permanent (1)</li> <li><input type="checkbox"/> Plates, paper (6)</li> <li><input type="checkbox"/> Potting soil or seed starter (about 8 qt)</li> <li><input type="checkbox"/> Rulers, metric (12)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Tomatoes with noticeable differences (2–5)</li> <li><input type="checkbox"/> Water (about 9 qt)</li> </ul>
<p><b>Preparation</b></p>	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 4 Resource A: Fast Plants Planting and Growing Instructions</li> <li><input type="checkbox"/> Lesson 4 Resource B: Tomato Photographs (optional)</li> <li><input type="checkbox"/> Lesson 4 Resource C: Species Stations Setup Instructions</li> <li><input type="checkbox"/> Lesson 4 Resource D: Species Stations Procedure Sheets</li> <li><input type="checkbox"/> Lesson 4 Resource E: Whale Flukes Photographs (optional)</li> <li><input type="checkbox"/> Lesson 4 Resource F: Northern Leopard Frog Photographs (optional)</li> </ul> <p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Set up species stations. (See Lesson 4 Resource C.)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 5 requires the prepared species stations.</li> <li><input type="checkbox"/> Lesson 12 requires 1 of each variety of Fast Plant. Continue to grow all 24 Fast Plants through the end of the Science Challenge.</li> <li><input type="checkbox"/> Lesson 13 requires the handheld magnifiers.</li> </ul>	



## Lesson 5

Materials	Kit Items	School Supplied Items
	None	None
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Species stations from Lesson 4 (4)	
Preparation	<b>Resources</b> <input type="checkbox"/> Lesson 4 Resource C: Species Stations Setup Instructions <input type="checkbox"/> Lesson 4 Resource E: Whale Flukes Photographs (optional) <input type="checkbox"/> Lesson 4 Resource F: Northern Leopard Frog Photographs (optional) <input type="checkbox"/> Lesson 5 Resource: Humpback Whale Feeding Style Diagrams  <input type="checkbox"/> <i>Here Come the Humpbacks!</i>	
	<b>Setup</b> <input type="checkbox"/> Set up species stations. (See Lesson 4 Resource C.) <input type="checkbox"/> Cue “Humpback Whales Work Together to Feed Using Bubble Net Technique” (WDC 2017) video ( <a href="http://phdsci.link/1274">http://phdsci.link/1274</a> ), “Trap-Feeding—a Novel Humpback Feeding Strategy (Compilation of Footage)” (MERS 2018) video ( <a href="http://phdsci.link/1275">http://phdsci.link/1275</a> ), and “Humpback Whales Kick-Feeding” (WDC 2016) video ( <a href="http://phdsci.link/1276">http://phdsci.link/1276</a> ). 	

## Lesson 6






Materials	Kit Items	School Supplied Items
	None	None
Preparation	<b>Resources</b> <input type="checkbox"/> Lesson 6 Resource A: Mystery Whale Flukes Photograph  <input type="checkbox"/> Lesson 6 Resource B: Individual Humpback Whale Profiles <input type="checkbox"/> Lesson 6 Resource C: Humpback Whale Photographs for Anchor Evidence Organizer <input type="checkbox"/> Lesson 6 Resource D: Conceptual Checkpoint Scenario 	
	<b>Setup</b> <input type="checkbox"/> Cue “Raw: Rare White Humpback Whale Sighted” (AP 2015) video ( <a href="http://phdsci.link/1277">http://phdsci.link/1277</a> ). 	

## Lesson 7


<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <p>None</p>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Baby and present-day photographs of four school staff members (or four famous people)</li> <li><input type="checkbox"/> Paper, 11" x 17" or larger (7 sheets)</li> <li><input type="checkbox"/> Scissors (1)</li> </ul>
	<p><b>Preparation</b></p> <p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 7 Resource A: Monarch Butterfly Sequence Cards </li> <li><input type="checkbox"/> Lesson 7 Resource B: Organism Sequence Cards</li> <li><input type="checkbox"/> Lesson 7 Resource C: Life Span Table </li> </ul> <p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ask four school staff members for a baby photograph and a present-day photograph. Consider asking the same staff members whose photographs were used in the Lesson 3 Launch. Alternatively, find and print baby photographs and present-day photographs of four famous people. Label the baby photographs as A, B, C, and D.</li> <li><input type="checkbox"/> Prepare monarch butterfly sequence cards. (See Lesson 7 Resource A.)</li> <li><input type="checkbox"/> Prepare organism sequence cards. (See Lesson 7 Resource B.)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 8 requires the prepared class life of an individual model.</li> </ul>	



## Lesson 8

<b>Materials</b>	<b>Kit Items</b> <input type="checkbox"/> String (48 ft)	<b>School Supplied Items</b> <input type="checkbox"/> Markers, permanent (6) <input type="checkbox"/> Paper clips (90) <input type="checkbox"/> Scissors (6) <input type="checkbox"/> Yardsticks or rulers, US customary (6)
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Class life of an individual model from Lesson 7 (1)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 8 Resource A: Cassowary Chick and Adult Bird Photographs  <input type="checkbox"/> Lesson 8 Resource B: Timeline Instructions <input type="checkbox"/> Lesson 8 Resource C: Rabbit Timeline Photographs  <input type="checkbox"/> Lesson 8 Resource D: Adult Rabbit Photograph  <input type="checkbox"/> Lesson 8 Resource E: Chicken Timeline Photographs  <input type="checkbox"/> Lesson 8 Resource F: Adult Chicken Photograph 	
	<b>Setup</b> <input type="checkbox"/> Print a copy of Timeline Instructions (Lesson 8 Resource B), Rabbit Timeline Photographs (Lesson 8 Resource C), and Chicken Timeline Photographs (Lesson 8 Resource E) for each group. <input type="checkbox"/> Cut string or yarn to create two 4-foot pieces for each group.	



## Lesson 9

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Beads, wooden, 14 mm (152)</li> <li><input type="checkbox"/> Bins, clear plastic, 6 qt (2)</li> <li><input type="checkbox"/> Food coloring, red, 1 oz (2)</li> <li><input type="checkbox"/> Gloves, disposable (24 pairs)</li> <li><input type="checkbox"/> Timers, digital (4)</li> </ul> <p><b>Module 1 Kit</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scales, digital, ± 1 g (2)</li> </ul>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Construction paper, blue, green, 9" × 11" (4 sheets each color)</li> <li><input type="checkbox"/> Containers for craft sticks, opaque (2)</li> <li><input type="checkbox"/> Containers for wooden beads (6)</li> <li><input type="checkbox"/> Craft sticks (8)</li> <li><input type="checkbox"/> Cups, plastic, 9 oz (18)</li> <li><input type="checkbox"/> File folders (2)</li> <li><input type="checkbox"/> Index cards, 3" × 5" (18)</li> <li><input type="checkbox"/> Markers, permanent (2)</li> <li><input type="checkbox"/> Paper towels (1 roll)</li> <li><input type="checkbox"/> Pitchers for water (2)</li> <li><input type="checkbox"/> Spoons, plastic (2)</li> <li><input type="checkbox"/> Water (about 14 qt)</li> </ul>
	<p><b>Preparation</b></p> <p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 9 Resource A: Radish Plant Photographs </li> <li><input type="checkbox"/> Lesson 9 Resource B: Trait Influence Stations Setup Instructions</li> <li><input type="checkbox"/> Lesson 9 Resource C: Trait Influence Stations Procedure Sheets</li> <li><input type="checkbox"/> Lesson 9 Resource D: Trait Influence Stations Text Resources</li> <li><input type="checkbox"/> Lesson 9 Resource E: Trait Influence Stations Diagrams and Photographs</li> </ul> <p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Set up trait influence stations. (See Lesson 9 Resource B.)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 10 requires the prepared class trait influence chart and trait influence stations.</li> <li><input type="checkbox"/> Lesson 13 requires the scales.</li> <li><input type="checkbox"/> Lesson 21 requires 120 of the beads, the bins, and the timers.</li> </ul>	



### Lesson 10

<b>Materials</b>	<b>Kit Items</b> <input type="checkbox"/> Gloves, disposable (24 pairs)	<b>School Supplied Items</b> None
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Class trait influence chart from Lesson 9 (1) <input type="checkbox"/> Trait influence stations from Lesson 9 (3)	
<b>Preparation</b>	<b>Resources</b> None	
	<b>Setup</b> <input type="checkbox"/> Set up trait influence stations. (See Lesson 9 Resource B.)	
	<b>Item Reuse</b> <input type="checkbox"/> Lesson 13 requires the prepared class trait influence chart.	

### Lesson 11

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 11 Resource: Conceptual Checkpoint Scenario  <input type="checkbox"/> <i>Here Come the Humpbacks!</i> 	
	<b>Setup</b> None	




## Lesson 12

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> F1 Non-Purple Stem, Yellow-Green Leaf Fast Plant; Non-Purple Stem, Hairless Fast Plant; and Yellow-Green Leaf Fast Plant from Lesson 4 (1 each)	
<b>Preparation</b> 	<b>Resources</b> <input type="checkbox"/> Lesson 12 Resource: Salt Truck Photograph 	
	<b>Setup</b> None	
	<b>Item Reuse</b> <input type="checkbox"/> Lesson 13 requires the prepared class fair test guidelines chart and the prepared Fast Plants.	
	<b>Advance Preparation for Lesson 13</b> <b>1 Day Before:</b> Prepare Fast Plants for the science challenge. (See Lesson 13 Resource.)	


## Lesson 13

<b>Materials</b>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Graduated cylinders, 50 mL (6)</li> <li><input type="checkbox"/> Magnifiers, handheld, plastic (6)</li> </ul> <p><b>Module 1 Kit</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scales, digital, <math>\pm 1</math> g (2)</li> </ul>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Markers, permanent (6)</li> <li><input type="checkbox"/> Rulers, metric (6)</li> <li><input type="checkbox"/> Salt (20 g)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Tape, masking (partial roll)</li> <li><input type="checkbox"/> Water (access)</li> </ul>
	<p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> F1 Non-Purple Stem, Yellow-Green Leaf Fast Plants; Non-Purple Stem, Hairless Fast Plants; and Yellow-Green Leaf Fast Plants from Lesson 4 (8 each)</li> <li><input type="checkbox"/> Class trait influence chart from Lesson 9 (1)</li> <li><input type="checkbox"/> Class fair test guidelines chart from Lesson 12 (1)</li> </ul>	
<b>Preparation</b>	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 13 Resource: Science Challenge: Fast Plant Preparation Instructions</li> </ul>	
	<p><b>Setup</b></p> <p>None</p> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 14 requires the prepared Science Challenge Fast Plants with group measuring and watering materials.</li> <li><input type="checkbox"/> Lesson 15 requires the 12 prepared Fast Plants that are not used in the Science Challenge and the prepared class trait influence chart.</li> </ul>	



## Lesson 14

<b>Materials</b>	<p><b>Kit Items</b></p> <p>None</p>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Coloring utensils (12 sets)</li> <li><input type="checkbox"/> Glue stick (1)</li> <li><input type="checkbox"/> Marker, permanent (1)</li> <li><input type="checkbox"/> Paper, 11" × 17" or larger (4 sheets)</li> <li><input type="checkbox"/> Scissors (1)</li> </ul>
	<p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Science Challenge Fast Plants with group measuring and watering materials from Lesson 13 (6 sets)</li> </ul>	
<b>Preparation</b>	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 14 Resource A: Rabbit Parent and Offspring Photographs </li> <li><input type="checkbox"/> Lesson 14 Resource B: Gouldian Finch Photographs </li> <li><input type="checkbox"/> Lesson 14 Resource C: Prepare Gouldian Finch Family Posters</li> <li><input type="checkbox"/> Lesson 14 Resource D: Gouldian Finch Parent Photographs </li> </ul>	
	<p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare Gouldian finch family posters. (See Lesson 14 Resource C.)</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 15 requires the prepared Science Challenge Fast Plants with group measuring and watering materials.</li> </ul>	



## Lesson 15

Materials	Kit Items	School Supplied Items
	None	None
	<p><b>Prepared Items from Previous Lessons</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> F1 Non-Purple Stem, Yellow-Green Leaf Fast Plants; Non-Purple Stem, Hairless Fast Plants; and Yellow-Green Leaf Fast Plants from Lesson 4 (4 each)</li> <li><input type="checkbox"/> Class trait influence chart from Lesson 9 (1)</li> <li><input type="checkbox"/> Science Challenge Fast Plants with group measuring and watering materials from Lesson 13 (6 sets)</li> </ul>	
<b>Preparation</b>	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 15 Resource A: Fast Plant Family Tree Diagram </li> <li><input type="checkbox"/> Lesson 15 Resource B: Fast Plant Photographs (optional)</li> </ul>	
	<p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare the 12 Fast Plants not used in the science challenge for student observation. Label each Non-Purple Stem, Hairless plant as Parent A; label each Yellow-Green Leaf plant as Parent B; and label each F1 Non-Purple Stem, Yellow-Green Leaf plant as Offspring. Divide the plants into 4 sets so that each set has 1 plant labeled Parent A, 1 plant labeled Parent B, and 1 plant labeled Offspring.</li> </ul> <p><b>Item Reuse</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 16 requires the prepared Science Challenge Fast Plants with group measuring and watering materials.</li> <li><input type="checkbox"/> Lesson 18 requires the prepared class trait influence chart.</li> </ul>	

## Lesson 16






<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Science Challenge Fast Plants with group measuring and watering materials from Lesson 13 (6 sets)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 16 Resource A: Finch Nest Photograph  <input type="checkbox"/> Lesson 16 Resource B: Finch Family Tree Diagram 	
	<b>Setup</b> <input type="checkbox"/> Print a color copy of the Finch Family Tree Diagram (Lesson 16 Resource B) for each student pair.	
	<b>Item Reuse</b> <input type="checkbox"/> Lesson 17 requires the prepared Science Challenge Fast Plants with group measuring and watering materials.	

## Lesson 17

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Science Challenge Fast Plants with group measuring and watering materials from Lesson 13 (6 sets)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 17 Resource A: Finch Flock Photograph  <input type="checkbox"/> Lesson 17 Resource B: Mystery Frog Image  <input type="checkbox"/> Lesson 17 Resource C: Frog Family Images	
	<b>Setup</b> <input type="checkbox"/> Identify four corners or areas of the classroom to use for a Question Corners routine. Print a color copy of each frog family image (Lesson 17 Resource C). Post one image in each corner. Then print a color copy of the mystery frog image (Lesson 17 Resource B) for each student or student pair. Alternatively, print four color copies of the mystery frog image, and post one in each corner alongside the frog family images. If using this approach, be sure to label the mystery frog image clearly and separate it from the frog family images.	
	<b>Item Reuse</b> <input type="checkbox"/> Lesson 18 requires the prepared Science Challenge Fast Plants with group measuring and watering materials.	



### Lesson 18

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Class trait influence chart from Lesson 9 (1) <input type="checkbox"/> Science Challenge Fast Plants with group measuring and watering materials from Lesson 13 (6 sets)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 18 Resource A: Young Rabbits Photograph  <input type="checkbox"/> Lesson 18 Resource B: Conceptual Checkpoint Scenario  <input type="checkbox"/> Lesson 18 Resource C: Humpback Whale Mother and Calf Photographs  <input type="checkbox"/> Lesson 18 Resource D: Humpback Whale Mother and White Calf Photograph 	
	<b>Setup</b> <input type="checkbox"/> Cue humpback whale mother and calf videos 1 ( <a href="http://phdsci.link/1295">http://phdsci.link/1295</a> ), and humpback whale mother and calf video 2 ( <a href="http://phdsci.link/1296">http://phdsci.link/1296</a> ). 	
	<b>Item Reuse</b> <input type="checkbox"/> Lesson 19 requires the prepared Science Challenge Fast Plants with group measuring materials and the prepared class trait influence chart.	

### Lesson 19

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> <input type="checkbox"/> Coloring utensils (6 sets)
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Class trait influence chart from Lesson 9 (1) <input type="checkbox"/> Science Challenge Fast Plants with group measuring materials from Lesson 13 (6 sets)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 19 Resource: Fast Plant Investigation Photographs (optional)	
	<b>Setup</b> None	



### Lesson 20

<b>Materials</b>		<b>Kit Items</b> None	<b>School Supplied Items</b> None
<b>Preparation</b>		<b>Resources</b> <input type="checkbox"/> Lesson 20 Resource: Bruegel the Elder and Bruegel the Younger Paintings	
		<b>Setup</b> None	





### Lesson 21

<b>Materials</b>	<b>Kit Items</b> <input type="checkbox"/> Beads, wooden, 14 mm (120) <input type="checkbox"/> Bins, clear plastic, 6 qt (2) <input type="checkbox"/> Clay, modeling, nonhardening ( $1\frac{1}{2}$ lb) <input type="checkbox"/> Measuring spoons, $\frac{1}{2}$ tsp (2) <input type="checkbox"/> Measuring spoons, tbsp (2) <input type="checkbox"/> Test tube racks (2) <input type="checkbox"/> Test tubes, plastic (40) <input type="checkbox"/> Timers, digital (4)	<b>School Supplied Items</b> <input type="checkbox"/> Binder clips, medium (4) <input type="checkbox"/> Cups, plastic, 9 oz (8) <input type="checkbox"/> Marker, permanent (1) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Straws, plastic (4) <input type="checkbox"/> Toothpicks (240) <input type="checkbox"/> Water (about 7 qt) <input type="checkbox"/> Yardstick or ruler, US customary (1)
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 21 Resource A: Trait Function Stations Setup Instructions <input type="checkbox"/> Lesson 21 Resource B: Trait Function Stations Photographs <input type="checkbox"/> Lesson 21 Resource C: Trait Function Stations Procedure Sheets	
	<b>Setup</b> <input type="checkbox"/> Set up Trait Function Stations (see Lesson 21 Resource A).	
	<b>Item Reuse</b> <input type="checkbox"/> Lesson 22 requires 1 of the timers and the prepared class trait function chart.	



## Lesson 22

<b>Materials</b>	<b>Kit Items</b> <input type="checkbox"/> Timer, digital (1)	<b>School Supplied Items</b> <input type="checkbox"/> Bags, paper (24) <input type="checkbox"/> Construction paper, black, white, 9" × 11" (15 sheets each color) <input type="checkbox"/> Cups, plastic, 9 oz (24)
	<b>Prepared Items from Previous Lessons</b> <input type="checkbox"/> Class trait function chart from Lesson 21 (1)	
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 22 Resource A: Rock Pocket Mice Photographs  <input type="checkbox"/> Lesson 22 Resource B: Desert Environments Photographs 	
	<b>Setup</b> <input type="checkbox"/> Prepare the materials for the predator and prey model by cutting sheets of black paper and sheets of white paper into 1-inch squares. Place 15 1-inch black paper squares and 15 1-inch white paper squares into a paper bag for each student. Set the timer aside to use during the lesson.	




## Lesson 23

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> <input type="checkbox"/> Scissors (1)
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 22 Resource A: Rock Pocket Mice Photographs  <input type="checkbox"/> Lesson 23 Resource A: Life of an Individual Model <input type="checkbox"/> Lesson 23 Resource B: Dark Rocky Desert Environment Photograph  <input type="checkbox"/> Lesson 23 Resource C: Rock Pocket Mouse Cards <input type="checkbox"/> Lesson 23 Resource D: Rock Pocket Mouse Life Events <input type="checkbox"/> Lesson 23 Resource E: Red Sandy Environment Photograph  <input type="checkbox"/> Lesson 23 Resource F: Mammoth Museum Exhibit Photograph 	
	<b>Setup</b> <input type="checkbox"/> Print a copy of Life of an Individual Model (Lesson 23 Resource A) for each student. <input type="checkbox"/> Prepare the rock pocket mouse cards. (See Lesson 23 Resource C.) <input type="checkbox"/> Determine how to display the rock pocket mouse life events. (See Lesson 23 Resource D.) The events should be covered at the beginning of the lesson and uncovered one at a time during the Model Rock Pocket Mouse Life Cycle activity. Consider posting the resource on a whiteboard and taping over each event with a separate piece of paper.	

## Lesson 24

<b>Materials</b>	<b>Kit Items</b> <input type="checkbox"/> Tape measures, 1.5 m (6) <input type="checkbox"/> String (8.5 m)	<b>School Supplied Items</b> <input type="checkbox"/> Meter sticks (6, optional) <input type="checkbox"/> Rulers, metric (6) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Tape, masking (partial roll)
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 24 Resource A: Two Gouldian Finches Photograph  <input type="checkbox"/> Lesson 24 Resource B: Reproductive Success Stations Setup Instructions <input type="checkbox"/> Lesson 24 Resource C: Reproductive Success Stations Text Resources <input type="checkbox"/> Lesson 24 Resource D: Reproductive Success Stations Printable Materials <input type="checkbox"/> Lesson 24 Resource E: Reproductive Success Stations Procedure Sheets	
	<b>Setup</b> <input type="checkbox"/> Set up reproductive success stations. (See Lesson 24 Resource B.) <input type="checkbox"/> Cue “Vicious Elephant Seal Battle on South Georgia” (Sidey 2010) video ( <a href="http://phdsci.link/1298">http://phdsci.link/1298</a> ) and long-tailed widowbird flying video ( <a href="http://phdsci.link/1299">http://phdsci.link/1299</a> ). 	

## Lesson 25

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
<b>Preparation</b>	<b>Resources</b> <input type="checkbox"/> Lesson 25 Resource A: Humpback Whale Group Illustration  <input type="checkbox"/> Lesson 25 Resource B: Humpback Whale Group Data Tables <input type="checkbox"/> Lesson 25 Resource C: Conceptual Checkpoint Scenario  <input type="checkbox"/> <i>Here Come the Humpbacks!</i> 	
	<b>Setup</b> None	


### Lesson 26

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> <input type="checkbox"/> Glue Sticks (24) <input type="checkbox"/> Scissors (24)
	<b>Preparation</b>	
<b>Preparation</b>	<b>Resources</b> None	
	<b>Setup</b> None	

### Lesson 27



No materials or preparation required.

### Lesson 28




<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
	<b>Preparation</b>	
<b>Preparation</b> 	<b>Resources</b> <input type="checkbox"/> Lesson 28 Resource: Content Standards	
	<b>Setup</b> <input type="checkbox"/> Score End-of-Module Assessments and write individual feedback. <input type="checkbox"/> Select End-of-Module Assessment responses to share with students. <input type="checkbox"/> Prepare visual for student connections between module learning and content standards. (See Lesson 28 Resource.)	
	<b>Advance Preparation for Lesson 1</b> <b>1 Day Before:</b> Build the rain gauge. (See Lesson 1 Resource A.) Place the rain gauge in an uncovered, level area outside 1 day before the lesson.	

# Weather and Sky Lesson Materials and Preparation



## Lesson 1

<p><b>Materials</b></p>	<p><b>Kit Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Bottle, clear plastic, 2 L (1)</li> <li><input type="checkbox"/> Fan, table (1)</li> <li><input type="checkbox"/> Gravel (1 cup)</li> <li><input type="checkbox"/> Pole, telescoping (1)</li> <li><input type="checkbox"/> Ruler, plastic (1)</li> <li><input type="checkbox"/> Safety goggles, student (24)</li> <li><input type="checkbox"/> Safety goggles, teacher (1)</li> <li><input type="checkbox"/> Thermometers, Fahrenheit (12)</li> <li><input type="checkbox"/> Wind sock (1)</li> </ul>	<p><b>School Supplied Items</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Marker, permanent (1)</li> <li><input type="checkbox"/> Paper clips (3–4)</li> <li><input type="checkbox"/> Rubber bands (2)</li> <li><input type="checkbox"/> Scissors (1)</li> <li><input type="checkbox"/> Water (access)</li> </ul>
<p><b>Preparation</b></p> 	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lesson 1 Resource A: Build a Rain Gauge Instructions</li> <li><input type="checkbox"/> Lesson 1 Resource B: Cloud Cover Photographs</li> </ul> <hr/> <p><b>Setup</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Identify an outdoor location where students can collect and record weather data. The location should include a shaded area where students can measure the outdoor air temperature.</li> <li><input type="checkbox"/> Cue beach video (<a href="http://phdsci.link/1876">http://phdsci.link/1876</a>). </li> <li><input type="checkbox"/> Prepare for wind sock demonstration by attaching the wind sock to the top of the telescoping pole.</li> <li><input type="checkbox"/> Prepare cloud cover cards. (See Lesson 1 Resource B.)</li> </ul> <p><b>Advance Preparation for Lesson 5</b></p> <p><b>4 Days Before:</b> Prepare Shadows Throughout the Day Photographs. (See Lesson 5 Resource.)</p>	



## Lesson 2

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
<b>Preparation</b>	<b>Resources</b>	
	<input type="checkbox"/> Lesson 2 Resource A: Same Trees During Different Times of Year Photographs  <input type="checkbox"/> Lesson 2 Resource B: 2017 Monthly Weather Graphs  <input type="checkbox"/> Lesson 2 Resource C: 2017 Seasonal Weather Graphs 	
<b>Preparation</b>	<b>Setup</b>	
	<input type="checkbox"/> Prepare 2017 monthly and seasonal weather graphs. (See Lesson 2 Resources B and C.)	


## Lesson 3

<b>Materials</b>	<b>Kit Items</b> None	<b>School Supplied Items</b> None
<b>Preparation</b>	<b>Resources</b>	
	<input type="checkbox"/> Lesson 2 Resource C: 2017 Seasonal Weather Graphs  <input type="checkbox"/> Lesson 3 Resource: 2017–2019 Seasonal Weather Graphs 	
<b>Preparation</b>	<b>Setup</b>	
	<input type="checkbox"/> Prepare 2017–2019 Seasonal Weather Graphs. (See Lesson 3 Resource.)	


## Lesson 4

<b>Materials</b>	<b>Kit Items</b>	<b>School Supplied Items</b>
	<input type="checkbox"/> Blocks, wooden, 3 cm × 5 cm × 1.5 cm (6) <input type="checkbox"/> Flashlights with batteries (6)	None
<b>Preparation</b>	<b>Resources</b>	
	<input type="checkbox"/> Lesson 4 Resource A: Great Wall of China Shadow Photographs  <input type="checkbox"/> Lesson 4 Resource B: Shadow System Photographs 	
<b>Preparation</b>	<b>Setup</b>	
	<input type="checkbox"/> Prepare Shadow System Photographs. (See Lesson 4 Resource B.)	

## Lesson 5

<b>Materials</b>	<b>Kit Items</b>	<b>School Supplied Items</b>
	<input type="checkbox"/> Block, wooden, 3 cm × 5 cm × 1.5 cm (1)	<input type="checkbox"/> Camera (1)
<b>Preparation</b>	<b>Resources</b>	
	<input type="checkbox"/> Lesson 5 Resource: Shadows Throughout the Day Photographs	
<b>Preparation</b>	<b>Setup</b>	
	<input type="checkbox"/> Cue shadow time-lapse video ( <a href="http://phdsci.link/1880">http://phdsci.link/1880</a> ). 	

## Lesson 6

<b>Materials</b>	<b>Kit Items</b>	<b>School Supplied Items</b>
	None	None
<b>Preparation</b>	<b>Resources</b>	
	<input type="checkbox"/> Lesson 6 Resource A: Photograph of the Moon  <input type="checkbox"/> Lesson 6 Resource B: Prepare Moon Calendars Instructions	
<b>Preparation</b>	<b>Setup</b>	
	<input type="checkbox"/> Prepare Moon calendars. (See Lesson 6 Resource B.)	



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- Sidey, Richard. 2010. "Vicious Elephant Seal Battle on South Georgia." YouTube video, 1:45, posted January 17, 2010, <https://www.youtube.com/watch?v=DU4xW79ASsg>.
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