

## Variation in Traits

### Lesson 2b: Evidence Helps Us Show Variation in Traits

<b>Grade 3</b>	<b>Length of lesson:</b> 50 minutes	<b>Placement of lesson in unit:</b> 2b of 7 two-part lessons on variation in traits
<b>Unit central question:</b> Do all of the mice living in the same environment, such as a field or forest, have an equal chance of surviving?		<b>Lesson focus questions:</b> Do plants show variation in traits? How do we know?
<b>Main learning goal:</b> Like animals, plants show variation in traits.		
<b>Science content storyline:</b> Animals like ladybugs, cats, dogs, and people have traits that are alike and different. But what about plants? Observation and measurement can help us determine whether plants of the same kind show variation in traits.		
<b>Ideal student response to the focus questions:</b> By observing and measuring plants, we can tell whether they have traits that vary. Carrots and leaves are two kinds of plants that show variation in their length. Other plants show variation in different traits.		

#### Preparation

<p><b>Materials Needed</b></p> <ul style="list-style-type: none"> <li>• Science notebooks</li> <li>• Chart paper and markers</li> </ul> <p><b>Student Handouts</b></p> <ul style="list-style-type: none"> <li>• 1.2 Bar Graph of Ladybug Spots (from lesson 1b)</li> </ul>	<p><b>Ahead of Time</b></p> <ul style="list-style-type: none"> <li>• Review the content background document, especially sections 3 and 4 on variation.</li> <li>• Prepare two class data tables on chart paper, one for carrots and one for leaves. (See the sample data table on slide 4.) Make sure you know the lengths of the shortest and longest carrot and leaf; then list the possible measurements in units: inches, half inches, and quarter inches. Students will place a mark next to the number that shows how long their plant is.</li> <li>• <b>ELL support:</b> This lesson is heavily language based, so ELL students will need strong support to understand the content and participate in the activities. Introduce students to the lesson materials, structure, and content in advance so they know what’s expected of them. Review the following vocabulary words as needed: <i>trait(s)</i>, <i>characteristics</i>, <i>variation/vary</i>, <i>ruler</i>. Use visual resources to reinforce these terms.</li> </ul>
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## Lesson 2b General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	<b>Link to previous lesson:</b> Students share their completed sentences from the previous lesson and review key science ideas about traits and variation.	<ul style="list-style-type: none"> <li>Like animals, plants have traits that help us identify them. By measuring a particular trait, we can determine whether that trait shows variation.</li> </ul>
1 min	<b>Lesson focus questions:</b> The teacher reviews the focus questions from the previous lesson: <i>Do plants show variation in traits? How do we know?</i>	
5 min	<b>Setup for activity:</b> Students record the length measurements of their carrots and leaves from the previous investigation on two class data tables.	<ul style="list-style-type: none"> <li>Observation and measurement can help us determine whether plants of the same kind show variation in one trait, such as the length of carrots or leaves.</li> </ul>
20 min	<b>Activity:</b> Students analyze their class data to determine whether carrots and leaves show variations in the length trait.	<ul style="list-style-type: none"> <li><i>Traits</i> are features or characteristics of living things that help us identify them. Some traits among individuals of the same kind of living thing show variation and others don't.</li> </ul>
10 min	<b>Follow-up to activity:</b> Students compare the class data tables showing variation in a plant trait with their bar graphs showing variation in a ladybug trait. Then the teacher asks students whether both ways of organizing data provide evidence of variation in traits among living things of the same kind.	<ul style="list-style-type: none"> <li>Scientists can organize data in different ways, such as using bar graphs or data tables, to determine whether some plants and animals show variations in a trait.</li> </ul>
8 min	<b>Synthesize/summarize today's lesson:</b> The teacher reviews the focus questions. Then students answer a related question by summarizing what they've learned so far about traits and variation among plants and animals of the same kind.	<ul style="list-style-type: none"> <li>Living things of the same kind show variation in some traits. We can use data from observations and measurements as evidence of variation in a particular trait.</li> </ul>
1 min	<b>Link to next lesson:</b> The teacher links science ideas to the next lesson.	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
5 min	<p><b>Link to Previous Lesson</b></p> <p><b>Synopsis:</b> Students share their completed sentences from the previous lesson and review key science ideas about traits and variation.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Like animals, plants have traits that help us identify them. By measuring a particular trait, we can determine whether that trait shows variation.</li> </ul>	<p>Link science ideas to other science ideas.</p> <p>Engage students in constructing explanations and arguments.</p> <p>Highlight key science ideas and focus question throughout.</p>	<p><b>Show slides 1 and 2.</b></p> <p>At the end of our last lesson, you completed this statement in your science notebooks:</p> <p><i>Plants [show/do not show] variation in their traits. My evidence is _____.</i></p> <p>Do you think plants show variation in their traits? Let's hear your ideas and evidence.</p> <p>What plant <i>trait</i> did you measure in our investigation?</p> <p>So length is a <i>trait</i> or characteristic of a plant.</p> <p>What is a <i>variation</i> in a trait?</p>	<p>I think plants do show variation in their traits. My evidence is that my leaf was shorter than the other leaves.</p> <p>Because I measured it.</p> <p>The length of [a carrot/leaf].</p> <p>It means it's not the same.</p> <p>The trait isn't the</p>	<p>How do you know your leaf was shorter?</p> <p>Tell me more about what's not the same.</p>

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			<p>How does <i>measuring</i> help us find out whether there's variation in a trait?</p> <p>Thank you for sharing your ideas!</p> <p>In this lesson, we'll bring all of our data together and look for patterns that can help us decide whether there's variation in the length trait of carrots and leaves.</p>	<p>same.</p> <p>The length isn't the same in all the plants, just like the number of spots on the ladybugs weren't all the same.</p> <p>We get numbers when we measure a trait.</p> <p>Some numbers are bigger or smaller, so that tells us whether the length of a plant is bigger or smaller than other plants.</p>	<p>Can you give us an example?</p> <p>Say more about the numbers.</p>
1 min	<p><b>Lesson Focus Questions</b></p> <p><b>Synopsis:</b> The teacher reviews the focus questions from the previous lesson: <i>Do plants</i></p>	Set the purpose with <u>focus question</u> or goal statement.	<p><b>Show slide 3.</b></p> <p>Today we'll continue investigating the focus questions from last time: <i>Do plants show variation in traits? How do we know?</i></p>		

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	<i>show variation in traits?</i> <i>How do we know?</i>		The plant data we collected last time will help us answer these questions.		
5 min	<p><b>Setup for Activity</b></p> <p><b>Synopsis:</b> Students record the length measurements of their carrots and leaves from the previous investigation on two class data tables.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>• Observation and measurement can help us determine whether plants of the same kind show variation in one trait, such as the length of carrots or leaves.</li> </ul>	Make explicit links between science ideas and activities <b>before</b> the activity.	<p>In this investigation, we'll look for evidence that can help us decide whether our plants show variation in the length trait.</p> <p>Which of the living things we investigated last time are of the same kind?</p> <p>That's right. We investigated two different kinds of living things, so we can only compare the lengths of the living things that are of the same kind.</p> <p><b>Show slide 4.</b></p> <p>I've started two data tables for you on chart paper, one for the carrots and one for the leaves.</p> <p>Choose one member of your small group from last time to add your group's data to the class data table for your plant. Your length measurements should already be</p>	<p>The carrots are the same kind of living thing.</p> <p>The leaves all come from the same kind of plant.</p>	

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			<p>recorded in your notebooks, so locate that data now. Make sure that plant length has been measured to the nearest quarter of an inch.</p> <p>When you've located your data, group representatives should come up and add your group's data to the correct table for carrots or leaves. Place an <i>X</i> next to the measurement on the table that matches the length of the carrot or leaf you measured. Then add <i>X</i> marks for the lengths of all the other plants your group measured.</p> <p><b>NOTE TO TEACHER:</b> <i>You should already have prepared the two data tables on chart paper prior to the lesson. The range of measurements should include the lengths of the shortest and longest carrots and leaves the groups measured. Measurements between the shortest and longest numbers should be represented in quarter-inch segments (e.g., 2 1/4, 2 1/2, 2 3/4). The tally marks on the sample table on slide 4 are shown as Xs. If you have students use Xs to mark their data, you could turn the table sideways and use it to discuss line plots.</i></p>		

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20 min	<p><b>Activity</b></p> <p><b>Synopsis:</b> Students analyze their class data to determine whether carrots and leaves show variations in the length trait.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>• <i>Traits</i> are features or characteristics of living things help us identify them. Some traits among individuals of the same kind of living thing show variation and others don't.</li> </ul>	Engage students in analyzing and interpreting data and observations.	<p><b>Show slide 5.</b></p> <p>Now let's examine our data and see if we can identify any trait variation in our plants.</p> <p><b>Small-group discussion:</b> In your small group, look at the data tables for each type of plant and discuss the questions on the slide:</p> <ul style="list-style-type: none"> <li>• Do you observe variation in the length trait for carrots? How can you tell?</li> <li>• Do you observe variation in the length trait for leaves? How can you tell?</li> </ul> <p><b>Whole-class discussion:</b> So do you observe variation in the length trait for carrots? How can you tell?</p>	<p>There is variation because we recorded different numbers for the length.</p> <p>I don't think there's any variation because all of the carrots are orange.</p>	<p>What do the different numbers tell us?</p> <p>Does anyone agree or</p>

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			<p>What about the leaves? Do you observe variation in the length trait? How can you tell?</p> <p><b>Show slide 6.</b></p> <p><b>Turn and Talk:</b> Now turn to an elbow partner and come up with at least two more traits that plants have. Then think of another kind of plant and decide whether it shows variation for those traits.</p> <p>Make sure the traits you come up with match our definition. Who can tell me what a trait is?</p> <p><b>Whole-class discussion:</b> Let’s hear from a few pairs. What other plant traits did you come up with? Does the plant you thought of show variation for one or both of those traits. How do you know?</p>	<p>It’s a characteristic that helps us identify a living thing of the same kind.</p>	<p>disagree?</p>
10 min	<p><b>Follow-Up to Activity</b></p> <p><b>Synopsis:</b> Students compare the class data tables showing variation in a plant trait with their bar graphs showing variation in a ladybug</p>	<p>Select content representations and models matched to the learning goal and engage</p>	<p><b>Show slide 7.</b></p> <p>Now find in your notebooks the bar graph from lesson 1 that showed the number of spots on different ladybugs.</p> <p><b>NOTE TO TEACHER:</b> <i>If time allows, have small groups discuss the following</i></p>		

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	<p>trait. Then the teacher asks students whether both ways of organizing data provide evidence of variation in traits among living things of the same kind.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Scientists can organize data in different ways, such as using bar graphs or data tables, to determine whether some plants and animals show variations in a trait.</li> </ul>	<p>students in their use.</p> <p>Engage students in analyzing and interpreting data and observations.</p>	<p><i>questions before engaging in a class discussion.</i></p> <p><b>Whole-class discussion:</b> What patterns did we observe in our class bar graph?</p> <p>Now look at our data tables for the carrots and leaves.</p> <p>What patterns did you observe for the length trait of either the carrots or the leaves?</p>	<p>None of the ladybugs had 0 spots.</p> <p>The fewest ladybugs had [X] spots.</p> <p>More ladybugs had [X] spots than [Y] spots.</p> <p>More of the carrots were <i>either</i> [X] inches long or [Y] inches long.</p> <p>There was only one really short carrot, and there were two really long carrots.</p> <p>More of the leaves</p>	<p>How do you know that none of the ladybugs had 0 spots?</p> <p>What is your evidence?</p> <p>How many more ladybugs had [X] spots?</p> <p><i>For all examples, ask these questions:</i></p> <ul style="list-style-type: none"> <li>How do you know?</li> <li>Can you provide evidence from the data table?</li> </ul>

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			<p><b>Show slide 8.</b></p> <p>Think about the bar graph and data tables we used to organize our data.</p> <p>How are a bar graph and a data table alike and different?</p> <p>Do both ways of organizing data help us find patterns?</p> <p>Do both show evidence of variation in traits of living things of the same kind? In what ways?</p> <p><b>Show slide 9.</b></p> <p>Do you see more or less trait variation for the number of spots on the ladybugs? What is your evidence?</p> <p>Do you see more or less trait variation for the length of the carrots? What is your evidence?</p>	<p>were the same length.</p> <p>There are lots of marks in the middle of the data table and not very many marks on the ends.</p>	

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			Do you see more or less trait variation for the length of the leaves? What is your evidence?		
8 min	<p><b>Synthesize/Summarize Today's Lesson</b></p> <p><b>Synopsis:</b> The teacher reviews the focus questions. Then students answer a related question by summarizing what they've learned so far about traits and variation among plants and animals of the same kind.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Living things of the same kind show variation in some traits. We can use data from observations and measurements as evidence of variation in a particular trait.</li> </ul>	<p>Highlight key science ideas and focus question throughout.</p> <p>Engage students in making connections by synthesizing and summarizing key science ideas.</p>	<p><b>Show slide 10.</b></p> <p>Today, we've been investigating the focus questions, <i>Do plants show variations in traits? How do we know?</i></p> <p>Studying the length trait of two different plants helped us answer these questions.</p> <p>To summarize what you've learned so far about variation in traits, think about two similar questions: <i>Do plants and animals of the same kind show variations in traits? How do we know?</i></p> <p>Write these questions in your science notebooks and answer them using what you observed and recorded in our investigations of ladybugs, carrots, and leaves.</p> <p>Don't forget to answer the second question, <i>How do we know?</i> Include evidence from the bar graph and data tables to support your ideas. Use the words <i>trait</i> and <i>variation</i> in your responses and make sure you're clear about what those</p>		

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			<p>words mean.</p> <p><b>Whole-class share-out:</b> Let’s hear some of your ideas for answering these questions. Make sure to include evidence from our bar graph and data tables.</p>		
1 min	<p><b>Link to Next Lesson</b></p> <p><b>Synopsis:</b> The teacher links science ideas to the next lesson.</p>	Link science ideas to other science ideas.	<p><b>Show slide 11.</b></p> <p>In our last two lessons, we discovered that plants have traits that help us identify and describe them. Even plants of the same kind, like carrots, show variation in their traits.</p> <p>Next time, we’ll explore how traits affect beetles and their chances of surviving in their desert environment.</p> <p>We’ll also gather more information to help us answer our unit central question, <i>Do all of the mice living in the same environment, such as a field or forest, have an equal chance of surviving?</i></p>		