

Variation in Traits

Lesson 2a: Living Things Show Variation in Traits

Grade 3	Length of lesson: 40 minutes	Placement of lesson in unit: 2a of 7 two-part lessons on variation in traits
Unit central question: Do all of the mice living in the same environment, such as a field or forest, have an equal chance of surviving?		Lesson focus questions: Do plants show variation in traits? How do we know?
Main learning goal: Like animals, plants show variation in traits.		
Science content storyline: 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.		
Ideal student response to the focus questions: 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>Materials Needed</p> <ul style="list-style-type: none"> • Science notebooks • Chart paper and markers • Rulers (1 per student) • Carrots (1 per student for half of the class) • Leaves from one type of bush or tree (1 per student for half of the class) 	<p>Ahead of Time</p> <ul style="list-style-type: none"> • Review the content background document, especially sections 3 and 4 on variation. • Purchase enough carrots of varying lengths for half of the students in class to measure. • Collect enough leaves from one type of bush or tree for half of the students in class to measure. Since students will measure the leaves from end to end, the best leaves to use for this exercise are elm, birch, beech, aspen, poplar, or cottonwood. Avoid leaves with several points. • ELL support: 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. In particular, make sure that ELL students know how to use rulers. If they don’t, explicitly demonstrate and teach this skill before the lesson. Review the following vocabulary words as needed: <i>trait(s)</i>, <i>characteristics</i>, <i>variation/vary</i>, <i>ruler</i>. Make sure that ELL students are familiar with the English word <i>carrot</i>. Use visual resources as needed to reinforce these terms.
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Lesson 2a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	Link to previous lesson: Students pair up and share what they learned about traits and variation in the previous lesson.	<ul style="list-style-type: none"> Animals like ladybugs, cats, and dogs have traits that help us identify them. Some of those traits show variation and others don't.
1 min	Lesson focus questions: The teacher introduces the focus questions, <i>Do plants show variation in traits? How do we know?</i>	
8 min	Setup for activity: The teacher asks students to name different kinds of plants. Then students pair up to discuss plant traits and whether plants show trait variation.	<ul style="list-style-type: none"> Like animals, plants have traits that help us identify them.
15 min	Activity: Working in small groups, students measure one plant trait—length—to determine whether it shows variation. Then they record these measurements in their science notebooks.	<ul style="list-style-type: none"> Observation and measurement can help us determine whether plants of the same kind show variation in traits.
5 min	Follow-up to activity: In their small groups, students share and compare their plant measurements. Then they consider whether these measurements can be used as evidence to help them determine whether plants show variation in traits.	<ul style="list-style-type: none"> Scientists use measurement data as evidence they can share and compare to determine whether plants of the same kind show variation in a trait.
5 min	Synthesize/summarize today's lesson: Using data from their plant investigation, students complete a statement that relates to the focus questions.	<ul style="list-style-type: none"> Living things of the same kind show variation in some traits.
1 min	Link to next lesson: The teacher announces that in the next lesson, students will compile their class data on plant length and use it to determine whether plants show variation in traits.	

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			<p>Great discussion, everyone!</p> <p>Today we'll learn more about traits and how they can vary.</p>	<p>There is variation in traits.</p>	<p>Does everyone agree with this idea? Thumbs up or thumbs down.</p> <p>Why do you agree or disagree?</p> <p>What does "variation" mean? Do animals show variation for all their traits?</p> <p>Does everyone agree with this idea? Thumbs up or thumbs down.</p> <p>Why do you agree or disagree?</p>
1 min	<p>Lesson Focus Questions</p> <p>Synopsis: The teacher introduces the focus questions, <i>Do plants show variation in traits?</i></p>	<p>Set the purpose with a <u>focus question</u></p>	<p>Show slide 3.</p> <p>In this lesson, we'll investigate another kind of living thing—plants—and think about these focus questions: <i>Do plants show</i></p>		

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	<i>How do we know?</i>	or goal statement.	<p><i>variation in traits? How do we know?</i></p> <p>Write these questions in your science notebooks and draw a box around them.</p> <p>NOTE TO TEACHER: <i>Write the focus questions on the board for students to refer to throughout the lesson.</i></p> <p>The evidence we gather during today’s investigation will help us answer these questions.</p>		
8 min	<p>Setup for Activity</p> <p>Synopsis: The teacher asks students to name different kinds of plants. Then students pair up to discuss plant traits and whether plants show trait variation.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Like animals, plants have traits that help us identify them. 	<p>Make explicit links between science ideas and activities before the activity.</p> <p>Ask questions to elicit student ideas and predictions.</p>	<p>Show slide 4.</p> <p>In our last lesson, we investigated ladybug traits and talked about the traits of cats and dogs.</p> <p>Based on those investigations, we know that animals show variation in their traits. But what about plants? That’s what we’ll explore today.</p> <p>First, can you name some kinds of plants?</p> <p>NOTE TO TEACHER: <i>During this discussion, accept all ideas without questioning or correcting them. Record them on chart paper so that students can revisit their ideas later and decide which should remain on the list and which should be</i></p>	<p>Trees are plants.</p> <p>We have a cactus in our yard.</p> <p>Flowers are plants.</p> <p>I think a tomato is a</p>	

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			<p><i>removed. If students suggest that flowers are a kind of plant, ask them to be more specific about the kind of flower they're thinking of (such as a rose, a dandelion, or a tulip). Flowers are components of plants, not a kind of plant.</i></p> <p>You've named quite a few plants!</p> <p>Show slide 5.</p> <p>Do you think plants have traits?</p> <p>Turn and Talk: Talk about these questions with your partner and list some of the traits plants might have. You can choose one of the plants on our class chart and name some of its traits.</p> <p>Remember, a <i>trait</i> is a feature or characteristic of living things of the same kind that helps us identify them. Make sure the plant traits you name match this definition.</p> <p>Also talk about whether you think plants show variation in their traits like animals do. Be ready to share specific examples to support your ideas.</p> <p>Whole-class discussion: Let's have a few pairs share your list of plant traits and your</p>	<p>plant.</p> <p>My mom has some different plants inside our house. They're all green.</p>	

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			<p>ideas about whether plants show variation in their traits. Make sure to include an example.</p> <p>ELL support: Review this activity with ELL students in advance. Let students know they should be prepared to share their ideas with the class. Then during the class discussion, ask each ELL pair for a response. Also let them know it's OK to repeat someone else's sentence. This is good practice in sharing ideas and will help make student thinking visible.</p>	<p><i>Possible traits:</i></p> <ul style="list-style-type: none"> • Color. • Flowers. • Leaves. • Height. <p><i>Possible variation in traits:</i></p> <ul style="list-style-type: none"> • How tall plants are. • Whether they have flowers. • What color they are. • What their leaves look like. 	<p><i>For all examples, ask this question:</i></p> <ul style="list-style-type: none"> • Does that fit our definition of a trait?
15 min	<p>Activity</p> <p>Synopsis: Working in small groups, students measure one plant trait—length—to determine whether it shows variation. Then they record these measurements in their science notebooks.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Observation and measurement can help us determine whether 	<p>Make explicit links between science ideas and activities during the activity.</p>	<p>Show slide 6.</p> <p>Next, we'll investigate two different kinds of plants to see if they show any variation in one of their traits.</p> <p>Some of you will look at carrots, and some of you will look at leaves from another kind of plant.</p> <p>For this investigation, you'll need to use a ruler, so let's make sure everyone knows how to read one. If you don't have your own ruler, raise your hand, and I'll give you one.</p>		

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	plants of the same kind show variation in traits.		<p>NOTE TO TEACHER: <i>Distribute rulers to any students who don't already have one. Ideally, ruler measurements should start at 0.</i></p> <p>Show slide 7.</p> <p>First, look at your rulers. On the far left side, there's a mark that represents the number 0. Everyone find the mark that represents 0.</p> <p>Now look at the longer lines with the numbers. Those are our inches. How many inches do you see on the ruler on this slide?</p> <p>The inches are divided into halves by lines that are a little shorter. These shorter lines are divided into fourths by lines that are even shorter.</p> <p>Show slide 8.</p> <p>Let's practice a few measurements to make sure you know how to read your rulers.</p> <p>NOTE TO TEACHER: <i>Ask students to identify each measurement on the slide indicated with a red arrow on the ruler: 1/2 inch, 2 1/4 inches, 4 3/4 inches, and 6 inches.</i></p>		

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			<p>In this investigation, some of you will measure the length of a carrot, and others will measure the length of a leaf.</p> <p>NOTE TO TEACHER: <i>Indicate which half of the class will measure carrots and which half will measure leaves, but don't distribute the plant materials yet.</i></p> <p><i>Inform students that each half of the class will divide up into small groups to measure their plants. (Alternatively, you could have students work in pairs.) Make sure that small groups measure only one type of plant—carrots or leaves—based on how you divided the class. This will make it easier for students to help one another with the measurements and compare their results and trait variations in preparation for recording class data in the next lesson.</i></p> <p>Show slide 9.</p> <p>Open your science notebooks to the page where you wrote today's focus question. Underneath the question, write the heading "Length of My [<i>Carrot/Leaf</i>]." Leave some space below that heading and then write another heading: "Length of Each Group Member's [<i>Carrot/Leaf</i>]." This is where you'll record all of your group's plant measurements.</p> <p>NOTE TO TEACHER: <i>Distribute the plant</i></p>		

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			<p><i>materials according to how you divided the class. Half of the class should receive carrots, and the other half of the class should receive leaves. Then have each half of the class split up into small groups or pairs for the activity.</i></p> <p>Now let's look at how to measure the plants with our rulers. Remember, we start at the 0, so line up the 0 with one end of the carrot or leaf. Then read the ruler where the carrot or leaf ends. Make sure not to move the plant while you're measuring it.</p> <p>I'll give you a few minutes to measure your plants. Make sure to measure to the nearest quarter of an inch (the smallest line on the ruler). Then record your measurements under the headings in your notebooks. Make sure to record the measurements from everyone in your small group, not just your own measurement.</p>		
5 min	<p>Follow-Up to Activity</p> <p>Synopsis: In their small groups, students share and compare their plant measurements. Then they consider whether these measurements can be used as evidence to help them determine whether</p>	Engage students in analyzing and interpreting data and observations.	<p>Show slide 10.</p> <p>Small-group discussion: In your small groups, I'd like you to place your carrots or leaves next to each other from shortest to longest. Then take a closer look at all of your measurements and talk about the questions on the slide.</p> <p>1. Are all of your measurements the</p>		

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	<p>plants show variation in traits.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Scientists use measurement data as evidence they can share and compare to determine whether plants of the same kind show variation in a trait. 		<p>same?</p> <ol style="list-style-type: none"> What do the measurements tell you about the length of the plants? (Compare your measurements with what you saw when you lined up your plants from shortest to longest.) Does the length trait of your plants show variation? How do you know? <p>NOTE TO TEACHER: <i>The purpose of this small-group discussion is to help students realize that measurements provide evidence of variation in a trait. They can observe the variations by lining up the actual carrots or leaves and discover that their measurements tell them exactly the same thing.</i></p>		
5 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: Using data from their plant investigation, students complete a statement that relates to the focus questions.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Living things of the same kind show variation in some traits. 	<p>Highlight key science ideas and focus question throughout.</p> <p>Engage students in making connections by synthesizing and summarizing</p>	<p>Show slide 11.</p> <p>In our next lesson, we'll find out how these measurements can help us answer our focus questions, <i>Do plants show variation in traits? How do we know?</i></p> <p>Using everything you've learned so far about traits and variation, complete the statement on the slide in your science notebooks:</p> <p><i>Plants [show/do not show] variation in their traits. My evidence is _____.</i></p> <p>Be prepared to share your answers and evidence with the class at the beginning of</p>		

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		key science ideas.	<p>our next lesson.</p> <p>ELL support: Review this activity with ELL students in advance. Make sure they understand what the statement means; then discuss some possible ways to complete it using what they've learned about traits and variation.</p>		
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher announces that in the next lesson, students will compile their class data on plant length and use it to determine whether plants show variation in traits.</p>	Link science ideas to others science ideas.	<p>Show slide 12.</p> <p>Next time, we'll record all of our measurements on two class data tables—one for carrots and one for leaves. Then we'll use this data to figure out whether plants show variation in traits.</p> <p>Do you think we'll see variation in the length trait in our plants?</p> <p>Let's find out!</p>		