

## Variation in Traits

### Lesson 3a: Does Variation Matter?

<b>Grade 3</b>	<b>Length of lesson:</b> 45 minutes	<b>Placement of lesson in unit:</b> 3a 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 question:</b> Why do trait variations among desert beetles matter?
<b>Main learning goal:</b> Within a species, trait variations affect which individuals survive longer than others in their environment.		
<b>Science content storyline:</b> In the wild, living things of the same kind show variation in traits. Models can help us predict how trait variation will affect the predator-prey relationship in a specific environment. These models show how differences, or variations, in certain traits help some living things survive better than others in their environment.		
<b>Ideal student response to the focus question:</b> Variation in a trait means that some individuals are more likely to survive than others. For example, some prey organisms blend into their environment better because of their color. The individuals that blend in are more likely to survive than those that don't blend in very well.		

#### Preparation

##### Materials Needed

- Science notebooks
- Chart paper and markers
- *For display only:*
  - Piece of fabric approximately 22" × 28" (The fabric design should simulate a desert-like environment.)
  - 45 colored pom-poms, 7 mm or 10 mm in size (9 pom-poms of each color: red, yellow, brown, green, and black)
  - 5 cups, approximately 8 ounces each

##### Student Handouts and Teacher Masters

- 3.1 Using the Desert Model (Teacher Master)
- 3.2 Beetles in the Desert (1 per student)

##### Ahead of Time

- Review the content background document, especially sections 3 and 4 on variation.
- Read through handout 3.1 (Using the Desert Model) and gather the materials to display as you introduce the model and explain to students what the materials represent. In this lesson, you'll orient students to the desert model and explain the roles, rules, and instructions to prepare them for the simulation in lesson 3b.
- **ELL support:** Introduce ELL students to the lesson materials, structure, and content in advance so they know what's expected of them and can follow along and participate. In particular, preview the desert model and simulation ahead of time if students aren't familiar with what scientific models are, what they represent, or how they're meant to function. Review the vocabulary words *trait* and *variation* and introduce the words *model*, *population*, *simulation/simulated*, *environment*, *fabric*, and *pom-poms*. Make sure students know what lizards, beetles, and deserts are, as well as what they're called in their home languages and English.

### Lesson 3a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	<b>Link to previous lesson:</b> The teacher engages students in a review of plant and animal traits and variations from previous lessons.	<ul style="list-style-type: none"> <li>• Living things of the same kind show variation in their traits.</li> </ul>
1 min	<b>Lesson focus question:</b> The teacher introduces the focus question, <i>Why do trait variations among desert beetles matter?</i>	
15 min	<b>Setup for activity:</b> Students read a story about variation in the traits of beetles that live in the desert.	<ul style="list-style-type: none"> <li>• In the wild, living things of the same kind show variation in their traits.</li> </ul>
10 min	<b>Activity:</b> The teacher introduces the model students will use in the next lesson to investigate whether some beetles will survive longer than others in their desert environment. Then students predict what will happen to the beetles.	<ul style="list-style-type: none"> <li>• Variation in color could affect which beetles survive longer than others in their desert environment.</li> </ul>
8 min	<b>Follow-up to activity:</b> Students share their predictions about whether some beetles will survive longer than others in their desert environment.	<ul style="list-style-type: none"> <li>• Variation in color could affect which beetles survive longer than others in their desert environment.</li> </ul>
5 min	<b>Synthesize/summarize today's lesson:</b> The teacher reviews the focus question. Then students revisit and revise their original predictions based on the class discussion.	<ul style="list-style-type: none"> <li>• Variation in a trait can affect which living things survive longer in their environment and which don't.</li> </ul>
1 min	<b>Link to next lesson:</b> The teacher announces that in the next lesson, students will use the desert model to test their predictions about whether some beetles live longer in their desert environment.	

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5 min	<p><b>Link to Previous Lesson</b></p> <p><b>Synopsis:</b> The teacher engages students in a review of plant and animal traits and variations from previous lessons.</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 their traits.</li> </ul>	Summarize key science ideas.	<p><b>Show slides 1 and 2.</b></p> <p>In previous lessons, we investigated some traits that help us identify living things like animals and plants. We also saw that living things of the same kind show variation in traits.</p> <p><b>NOTE TO TEACHER:</b> <i>As needed, refer to the circle maps, bar graphs, and data tables from previous lessons to highlight traits and variation in the traits of animals and plants students have investigated so far.</i></p> <p>What trait variations in animals did we investigate?</p> <p>What trait variations in plants did we investigate?</p> <p>What did we discover?</p> <p>Today we'll continue thinking about variation in traits as we investigate what can happen in nature when a particular trait shows variation.</p>	<p>The number of spots on ladybugs.</p> <p>Fur color in cats.</p> <p>The length of carrots.</p> <p>The length of leaves.</p> <p>There were variations in all of these traits.</p>	

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1 min	<p><b>Lesson Focus Question</b></p> <p><b>Synopsis:</b> The teacher introduces the focus question, <i>Why do trait variations among desert beetles matter?</i></p>	Set the purpose with a <u>focus question</u> or goal statement.	<p><b>Show slide 3.</b></p> <p>So we’ve observed that living things of the same kind show variation in some of their traits, but do those variations matter?</p> <p>Today we’ll investigate trait variation in another kind of living thing, <i>desert beetles</i>.</p> <p>The focus question we’ll think about is <i>Why do trait variations among desert beetles matter?</i></p> <p>Write this question in your science notebooks and draw a box around it.</p> <p><b>NOTE TO TEACHER:</b> <i>Write the focus question on the board for students to refer to throughout the lesson.</i></p> <p>Let’s read a story that will help us learn about beetles and their traits.</p>		
15 min	<p><b>Setup for Activity</b></p> <p><b>Synopsis:</b> Students read a story about variation in the traits of beetles that live in the desert.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>• In the wild, living things of the same kind show</li> </ul>		<p><b>NOTE TO TEACHER:</b> <i>Distribute handout 3.2 (Beetles in the Desert). This story reviews science ideas from previous lessons to help students prepare for today’s investigation and the next lesson.</i></p> <p><b>ELL support:</b> Preview the story with ELL students ahead of time to make sure they understand the ideas. You may want to have ELL students pair up with shared-language</p>		

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	variation in their traits.	Make explicit links between science ideas and activity <b>before</b> the activity.	<p>partners to discuss the story.</p> <p><b>Show slide 4.</b></p> <p>While you're reading the story silently, think about the questions on the slide.</p> <ul style="list-style-type: none"> <li>• What living thing is this story about?</li> <li>• What are some of its traits?</li> <li>• Is there variation in the traits?</li> </ul> <p>When you find information in the story that helps you answer these questions, underline it. Also underline any traits you identify.</p> <p><b>Individual reading time.</b></p> <p><b>Turn and Talk:</b> Now that you've finished reading and underlining important information in the story, talk with an elbow partner about the living thing this story is about.</p> <p>Share with your partner two traits you underlined for that living thing. Then discuss whether either of these traits shows variation in the story. Be prepared to share your ideas with the class.</p> <p><b>ELL support:</b> Make sure to call on ELL students to share their ideas during the class discussion. If you think it might be helpful,</p>		

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			<p>list the traits on chart paper as students share them.</p> <p><b>Whole-class share-out:</b> Let’s hear some of the traits and variations you discovered in the story. First, what traits did you talk about?</p> <p><b>NOTE TO TEACHER:</b> <i>As students share their ideas, point to the trait and variation definitions posted in the classroom and encourage students to refer to the definitions as they explain why they think something in the story is or isn’t a trait or variation.</i></p> <p>Did you observe any variation in the story for the traits you talked about?</p>	<p>The different colors of the beetles.</p> <p>The color of the lizard.</p> <p>The color of the desert <i>[Incorrect]</i></p> <p>The lizard eats beetles. <i>[Incorrect]</i></p> <p>There is variation in the color of the beetles.</p>	<p>Explain why the color of the beetles is a trait.</p> <p>How do you know the color of the lizard is a trait?</p> <p>Tell us why you think the color of the desert is a trait.</p> <p>Does anyone agree or disagree that the lizard eating beetles is a trait? Why?</p> <p>Earlier, we said that the color of the beetles was a trait. Is it also a variation?</p>

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10 min	<p><b>Activity</b></p> <p><b>Synopsis:</b> The teacher introduces the model students will use in the next lesson to investigate whether some beetles will survive longer than others in their desert environment. Then students predict what will happen to the beetles.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Variation in color could affect which beetles survive longer than others in their desert environment.</li> </ul>	Select content representations and models matched to the learning goal and engage students in their use.	<p><b>Show slide 5.</b></p> <p>The ranger in our story referred to a model we’re going to use in the next lesson to learn more about what can happen to beetles in nature.</p> <p>First, let’s go over what the model and each part represent.</p> <p><b>NOTE TO TEACHER:</b> <i>Make sure students understand that the model represents what might happen to the beetles in nature. First, show students the pom-poms and explain that each pom-pom represents a beetle. The different colors represent the beetle colors the ranger talked about in the story. Next, show students the fabric and explain that it represents the desert environment where the beetles live. Help them picture the lizard in the story catching the beetle in its mouth. Pinch your index finger and thumb together and tell students that this represents or simulates the lizard eating a beetle. Once the lizard eats, the pom-poms will be placed in the cup. Tell students that the cup represents the lizard’s stomach.</i></p> <p>The model represents what might happen to the beetles in nature. Each pom-pom represents a beetle of a different color. We’ll use green, red, yellow, brown, and black pom-poms to represent the colors the ranger talked</p>		

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			<p>about in the story. The fabric represents the desert environment where the beetles and lizards in our story live. The cup represents the lizard’s stomach.</p> <p>Try to picture the green beetle in the story and think about what happened when a lizard came along and grabbed the beetle with its mouth. In our simulation next time, you’ll use your thumb and index finger to represent a lizard eating a beetle. To grab a pom-pom beetle, you’ll pinch your thumb and forefinger together like this. That’s your mouth! Now you try it.</p> <p><b>ELL support:</b> It’s important to preview this model with ELL students so they’ll understand what you’re demonstrating.</p> <p>Next, I’ll explain the different roles you’ll play in the simulation and the rules we’ll follow.</p> <p><b>NOTE TO TEACHER:</b> <i>Walk students through the roles, rules, and instructions from handout 3.1 (Using the Desert Model). Invite them to ask questions about the simulation to make sure they understand the purpose of the simulation and what they’ll be doing.</i></p> <p><b>Show slide 6.</b></p> <p><b>Turn and Talk:</b> Now that you know what</p>		

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		Ask questions to elicit student ideas and predictions.	<p>our model and the different parts represent, discuss with an elbow partner what you think will happen to the beetles in our desert environment.</p> <p>Do you think some of the beetles will survive longer than other beetles? Why or why not? Which beetles might get eaten first or last?</p> <p><b>ELL support:</b> Consider having ELL students pair up with a shared-language partner for this discussion.</p> <p>After sharing your ideas with your partners, write a prediction in your science notebooks that answers the question on the slide:</p> <p><i>Do you think some beetles will survive longer than other beetles in our desert environment?</i></p> <p>List one or two reasons why you think a particular beetle might or might not survive longer than other beetles.</p>		
8 min	<p><b>Follow-Up to Activity</b></p> <p><b>Synopsis:</b> Students share their predictions about whether some beetles will survive longer than others in their desert environment.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Variation in color could</li> </ul>	Engage students in constructing explanations and arguments.	<p><b>Show slide 7.</b></p> <p><b>Whole-class discussion:</b> Let’s hear your predictions about whether some beetles will survive longer than others in our desert environment. Make sure to include your reasons.</p> <p>When you share, use the sentence starter on</p>		

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	affect which beetles survive longer than others in their desert environment.	Engage students in communicating in scientific ways.	<p>the slide: <i>I predict that some beetles [will/won't] survive longer than others in our desert environment because _____.</i></p> <p><b>ELL support:</b> Review the sentence starter with ELL students ahead of time and have them practice completing it so they're prepared to participate during the actual discussion.</p> <p>As you listen to your classmates' predictions, think about whether their ideas and reasons make sense. Be prepared to agree or disagree, add to an idea, or ask questions.</p> <p>Let's act like scientists and communicate in scientific ways! Say things like "I agree with your idea because ...," "I disagree with your idea because ...," "I want to add ...," or "I have a question about ..."</p> <p><b>NOTE TO TEACHER:</b> <i>Draw students' attention to the sentence starters on Communicating in Scientific Ways poster and encourage students to use them during the discussion. Encourage as many students as possible to share their ideas in the allotted time.</i></p>	<p>I predict that the yellow beetles will be eaten first because they stand out a lot.</p> <p>They're bright.</p> <p>I predict that the red beetles will be eaten last.</p> <p>Because my dad says that red insects taste bad.</p>	<p>What do you mean by "stand out a lot"? Why do you think they stand out?</p> <p>Why do you think that?</p>
5 min	<p><b>Synthesize/Summarize Today's Lesson</b></p> <p><b>Synopsis:</b> The teacher</p>	Highlight key science ideas	<p><b>Show slide 8.</b></p> <p>Our focus question for this lesson is <i>Why do trait variations among desert beetles matter?</i></p>		

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	<p>reviews the focus question. Then students revisit and revise their original predictions based on the class discussion.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Variation in a trait can affect which living things survive longer in their environment and which don't.</li> </ul>	<p>and focus question throughout.</p> <p>Engage students in constructing explanations and arguments.</p>	<p>We'll continue thinking about this question in our next lesson and gather some more information to help us answer it.</p> <p><b>Show slide 9.</b></p> <p>Earlier, we discussed the question, <i>Do you think some beetles will survive longer than other beetles in our desert environment?</i></p> <p>You shared some interesting ideas and predictions during our discussion. Take a moment and look at the predictions you wrote in your notebooks.</p> <p>Have your predictions changed based on the ideas we shared? If so, take a few minutes to revise them. You can change or add to your original prediction, or you can start over and write a new prediction and reasons to support it.</p> <p>Be ready to share your ideas and predictions with the class at the beginning of our next lesson.</p>		
1 min	<p><b>Link to Next Lesson</b></p> <p><b>Synopsis:</b> The teacher announces that in the next lesson, students will use the desert model to test their</p>	<p>Summarize key science ideas.</p> <p>Link science</p>	<p><b>Show slide 10.</b></p> <p>Today we read a story about lizards eating beetles in the desert, and you predicted whether some beetles will survive longer than others in their environment.</p>		

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	<p>predictions about whether some beetles live longer in their desert environment.</p>	<p>ideas to other science ideas.</p>	<p>In our next investigation, we'll use our desert model to test our predictions.</p> <p>Do you think variation in traits among beetles has anything to do with their survival?</p> <p>Stay tuned! We'll find out next time.</p>		