

Variation in Traits

Lesson 5a: A Change of Scenery

Grade 3	Length of lesson: 48 minutes	Placement of lesson in unit: 5a 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 question: What happens if the beetles' environment changes?
Main learning goal: Variation in traits and the environment affect which plants or animals of the same kind survive long enough to produce young (babies).		
Science content storyline: Often, trait variation means that some individuals of the same kind of living thing are more likely to survive than others in their environment. If the environment changes, individuals with certain variations are more likely to survive for a longer time. This means that both trait variation and the environment affect which individuals are more likely to survive.		
Ideal student response to the focus question: Changes in the beetles' environment will affect which beetles survive longer than others. For example, if a drought makes the desert even browner than it was before, beetles with the brown color trait will have a better chance of surviving than beetles with the yellow color trait.		

Preparation

Materials Needed

- Science notebooks
- Chart paper and markers
- Class data table of desert-simulation results (from lesson 3b)
- Chart of simulation rules (from lesson 3b)
- *Desert model (from lesson 3b):*
 - Piece of fabric approximately 22" × 28"
 - 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
- Piece of fabric approximately 22" × 28" with more brown color than the fabric used in lesson 3

Teacher Masters

- 3.1 Using the Desert Model (Teacher Master) (from lesson 3a)

Ahead of Time

- Review the content background document, especially sections 3 and 4 on variation.
- On chart paper, create a new class data table like the one in lesson 3b. As in lesson 3, students will record on this table the number of beetles that survive the hunts and the number of beetles that are eaten
- Display the simulation rules from lesson 3b where students can see them.
- **ELL support:** This lesson is heavily language based, so ELL students will need strong support to succeed in understanding the content and participating in the activities. Introduce students to the lesson materials, structure, and content in advance so they know what's expected of them. In particular, review the desert model and simulation, as well as the simulation data from lessons 3 and 4. Make sure ELL students understand what the results represent, how they were derived, and what they mean. As needed, review how to calculate fractions and construct a bar graph. Introduce the vocabulary word *drought* and review the words *data*, *calculate*, *convince/convincing*, *evidence*, *fraction*, and *survive/survived*. Make sure students understand what these words mean in general and in this lesson. Also discuss the contextual meaning of such phrases as *more likely* and *long enough*, since these may be difficult for students to ELL students to understand.

Lesson 5a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
8 min	Link to previous lesson: The teacher reviews the results of the desert simulation and revisits students' claims and evidence for answering the question, <i>Do differences in the color of desert beetles affect whether they get eaten?</i>	<ul style="list-style-type: none"> Variation in a trait among living things of the same kind often means that some individuals are more likely to survive than others in their environment.
1 min	Lesson focus question: The teacher introduces the focus question, <i>What happens if the beetles' environment changes?</i>	
10 min	Setup for activity: Students predict how a change in the beetles' environment will affect which beetles are eaten and which survive.	<ul style="list-style-type: none"> If the environment changes, some beetles will be more likely to survive because of variations in their color trait.
10 min	Activity: Using a new piece of fabric to represent the beetles' environment, students conduct another simulation to determine what happens to the beetles when their environment changes.	<ul style="list-style-type: none"> Both variation in traits and the environment affect which plants or animals of the same kind survive and which don't.
10 min	Follow-up to activity: Students compare their simulation results with the results from lesson 3. Then they discuss the impact of a change in the environment on the beetles' survival.	<ul style="list-style-type: none"> If the environment changes, desert beetles with different color variations are more likely to survive than those that survived in the original environment.
8 min	Synthesize/summarize today's lesson: Students answer the focus question using data from the desert model to support their ideas. Then the teacher summarizes key science ideas from the lesson.	<ul style="list-style-type: none"> Both variation in traits and the environment affect which plants or animals of the same kind are more likely to survive longer than others.
1 min	Link to next lesson: The teacher informs students that in the next lesson, they'll investigate whether trait variations help other living survive when their environment changes.	

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8 min	<p>Link to Previous Lesson</p> <p>Synopsis: The teacher reviews the results of the desert simulation and revisits students' claims and evidence for answering the question, <i>Do differences in the color of desert beetles affect whether they get eaten?</i></p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Variation in a trait among living things of the same kind often means that some individuals are more likely to survive than others in their environment. 	Link science ideas to other science ideas.	<p>Show slides 1 and 2.</p> <p>In the last few lessons, we used a model to simulate what happens to desert beetles in their environment.</p> <p>The different-colored pom-poms represented our beetles, and some of you represented lizards.</p> <p>Each time I gave the command to hunt, our student lizards opened their eyes and grabbed the first pom-pom beetle they saw.</p> <p>NOTE TO TEACHER: <i>If you feel that your students need to review key ideas from the desert simulation in lesson 3, write the word Trait on the board and Color of Beetle underneath. Next, write Variation and list the pom-pom colors: red, yellow, brown, green, and black. Then review the key ideas from the simulation.</i></p> <p>ELL support: Before the lesson, review key ideas from the desert simulation with ELL students.</p> <p>What did we find out about which beetles were eaten and which survived?</p>	Beetles of some colors got eaten more often than beetles of other colors.	Tell us more

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		Summarize key science ideas.	<p>So <i>variation</i> in the color trait of a beetle affected its ability to survive.</p> <p>Show slide 3.</p> <p>In our last lesson, you made scientific claims to explain why differences in the color of desert beetles affect whether they get eaten. To support your claims, you used evidence from our simulation results.</p> <p>Let's review some of our revised claims.</p> <p>NOTE TO TEACHER: <i>Invite one or two students to share their claims. Alternatively, read the single claim the class created at the end of lesson 4b if you came up with one.</i></p> <p>What important science idea did we highlight in our claims and explanations?</p> <p>What kind of evidence did we use to support our claims?</p>	<p>Variation in the color trait affected which beetles survived and which beetles got eaten.</p> <p>We used the number</p>	<p>about what happened with the different colors.</p> <p>Can anyone add to this idea?</p>

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			<p>We didn't make up our claims, did we? We used the data from our simulation as evidence to prove that our claims were valid.</p> <p>ELL support: It might be helpful to explicitly connect (or ask ELL students to connect) the data, evidence, and/or claims in this discussion to the simulation context from previous lessons.</p> <p>In this lesson, we'll investigate something else that can affect the survival of living things: changes in the environment.</p>	<p>of beetles that were eaten and the number that survived.</p> <p>From our data table, our fractions, and our bar graph.</p>	<p>Where did we get that information?</p>
1 min	<p>Lesson Focus Question</p> <p>Synopsis: The teacher introduces the focus question, <i>What happens if the beetles' environment changes?</i></p>	<p>Set the purpose with a <u>focus question</u> or goal statement.</p>	<p>Show slide 4.</p> <p>The focus question we'll think about today is <i>What happens if the beetles' environment changes?</i></p> <p>Write this question in your science notebooks and draw a box around it.</p> <p>NOTE TO TEACHER: <i>Write the focus question on the board for students to refer to throughout</i></p>		

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			<p><i>the lesson.</i></p> <p>To gather the information we need to answer this question, we'll continue working with our desert model from lesson 3.</p> <p>ELL support: Explicit review and discussion of the focus question ahead of time will lay an important foundation for ELL students.</p> <p>Will the changes in the desert beetles' environment affect their survival? Let's find out!</p>		
10 min	<p>Setup for Activity</p> <p>Synopsis: Students predict how a change in the beetles' environment will affect which beetles are eaten and which survive.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> If the environment changes, some beetles will be more likely to survive because of variations in their color trait. 	<p>Ask questions to elicit student ideas and predictions.</p> <p>Make explicit links between science ideas and activities before the activity.</p>	<p>Show slide 5.</p> <p>First, what do we mean when we talk about an environment? What is an environment?</p> <p>What did we use to represent the environment in our desert model?</p> <p>How does the fabric fit with how we just</p>	<p>It's everything around us.</p> <p>It's an animal's home.</p> <p>It's where an animal lives.</p> <p>Fabric.</p>	<p>Can you give some specific examples of what is around us?</p> <p>What do you mean by "home"?</p>

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		Highlight key	<p>described an environment?</p> <p>Let’s look at the fabric we used in lesson 3 to represent the environment in our desert model.</p> <p>NOTE TO TEACHER: <i>Hold up the fabric from lesson 3 and describe the colors.</i></p> <p>The colors on this fabric represent how the ground and plants that grow in the desert might look. The colors could also represent animals that live in the desert.</p> <p>ELL support: It might be more helpful for ELL students if you ask them to describe the colors and what they represent rather than describing them yourself.</p> <p>Show slide 6.</p> <p>Sometimes environments change, like when there</p>	<p>They both have lots of colors.</p> <p>The fabric is all around the beetles.</p>	<p>Say more about how the fabric and the environment have lots of colors.</p> <p>What do you mean by “all around”?</p>

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		<p>science ideas and focus question throughout.</p>	<p>is very little rainfall in an area. This can lead to a water shortage or drought. California and other western states have been experiencing problems with drought in recent years. Droughts can happen in other parts of the world, too. When an area experiences drought, plants might die and animals might move away because there is less food and water.</p> <p>NOTE TO TEACHER: <i>Hold up the new piece of fabric and the old piece of fabric so that students can compare them.</i></p> <p>Show slide 7.</p> <p>Take a look at this new piece of fabric and compare it with the other fabric we used for our desert simulation in lesson 3. Both pieces of fabric represent the environment where the desert beetles live, but the new fabric represents a change in the environment.</p> <p>What do you notice about this new piece of fabric? How is it different from the other fabric? What has changed?</p>	<p>It has different colors than the last one.</p> <p>This looks even more like a desert.</p>	<p>What do you think that means?</p> <p>What about it looks more like a</p>

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		Ask questions to elicit student ideas and predictions.	<p>Show slide 8.</p> <p>What do you think will happen to the beetles in this changed environment?</p> <p>Which colors of beetles do you think will be eaten more often, and which will survive more often?</p> <p>Turn and Talk: Share your predictions with an elbow partner. Then write your predictions and explanations in your science notebooks using the sentence starters on the slide.</p> <p><i>I predict that more of the [color] beetles will be eaten because _____.</i></p> <p><i>I predict that more of the [color] of beetles will survive because _____.</i></p> <p>ELL support: Give ELL students an opportunity to practice making predictions and using the sentence starters during the lesson preview.</p>		desert?
10 min	<p>Activity</p> <p>Synopsis: Using a new piece of fabric to represent the beetles' environment, students conduct another simulation to determine what happens to the</p>	Select content representations and models matched to the learning goal and engage students in their use.	<p>Let's conduct our desert simulation again using this new environment and see if the results match your predictions.</p> <p>This time I'll assign each of you a different role. Counters, I'll also assign you a pom-pom color to keep track of during the simulation.</p>		

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	<p>beetles when their environment changes.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Both variation in traits and the environment affect which plants or animals of the same kind survive and which don't. 	<p>Engage students in using and applying new science ideas in a variety of ways and contexts.</p>	<p>Show slide 9.</p> <p>Before we begin, let's quickly review your new roles and responsibilities.</p> <p>NOTE TO TEACHER: <i>Briefly review the roles on the slide (from handout 3.1, Using the Desert Model) and the list of rules from lesson 3b (on chart paper). Make sure the rules are posted in the classroom where students can refer to them throughout the simulation.</i></p> <p><i>Display the new class data table where students can see it and post the class data table from lesson 3b next to the new data table so that students can compare the results.</i></p> <p><i>Then direct students to get in position, with lizards in a circle around the fabric, counters and observers in a larger circle around the lizards, and the recorder standing next to the new data table. Distribute a cup to each lizard.</i></p> <p>ELL support: Review the simulation rules and the new class data table with ELL students ahead of time.</p> <p>OK, before we begin, I need our student lizards to close your eyes. No peeking! When I give the hunt command, open your eyes, grab the first pom-pom beetle you see, and place it in your cup. Then close your eyes again until I give the next hunt command.</p>		

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			<p>NOTE TO TEACHER: <i>After lizards have closed their eyes, spread the colored pom-poms across the fabric. Instruct the counters to count the number of pom-poms in their assigned colors and report the result to the recorder. Have the recorder write these numbers in the first row of the data table.</i></p> <p>Counters, please count the number of pom-pom beetles in your assigned color and report that number to the recorder one at a time. Recorder, as the counters report their numbers, please fill in the first row on our class data table.</p> <p>NOTE TO TEACHER: <i>Remind counters to make tally marks in their science notebooks for the number of beetles in their assigned colors that are still on the fabric after the round. At the end of the round, counters should report the total number in their assigned colors and report the information to the recorder.</i></p> <p>Let's begin our simulation!</p> <p>Lizards, read, set, HUNT!</p> <p>NOTE TO TEACHER: <i>As in lesson 3b, carry out six hunts to complete one round. Then direct the counters to count how many pom-pom beetles in their assigned colors are still on the fabric. Have each counter report this information to the recorder. Make sure the recorder writes the</i></p>		

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			<i>numbers accurately on the class data table.</i>		
10 min	<p>Follow-Up to Activity</p> <p>Synopsis: Students compare their simulation results with the results from lesson 3. Then they discuss the impact of a change in the environment on the beetles' survival.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> If the environment changes, desert beetles with different color variations are more likely to survive than those that survived in the original environment. 	<p>Make explicit links between science ideas and activities after the activity.</p> <p>Engage students in analyzing and interpreting data and observations.</p>	<p>So did our simulation results match your predictions?</p> <p>Give me a thumbs-up if they did and a thumbs-down if they didn't.</p> <p>Show slide 10.</p> <p>Now let's look at the data on our class data tables and compare the results of the first simulation with the results of today's simulation.</p> <p>ELL support: It might be helpful if you attach a small section of desert fabric from each simulation to a corner of the corresponding class data tables to remind ELL students of what the data represent.</p> <p>Which color of beetle was eaten <i>most often</i> in each simulation?</p> <p>Which color of beetle was eaten <i>least often</i> in each simulation?</p> <p>Why do you think the results of the two simulations are different?</p> <p>Turn and Talk: Talk about these questions with an elbow partner; then write your ideas in your science notebooks.</p>		

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		<p>Highlight key science ideas and focus question throughout.</p>	<p>Whole-class discussion: Which color of beetle was eaten most often and least often in each of our simulations?</p> <p>Why do you think the results of the two simulations were different?</p> <p>Show slide 11.</p> <p>In our last lesson, we investigated the question, <i>How can data help us explain why trait variations among desert beetles matter?</i></p> <p>How did we answer this question?</p>	<p>The fabric changed so different beetles were eaten.</p> <p>The different colors of the fabric made it easier for the lizard to see different colors of beetles in this environment.</p> <p>The data made it easier to see how many beetles of a color survived and how many were eaten. That helped us explain why trait</p>	<p>Why did a different piece of fabric result in different beetles being eaten?</p>

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			<p>Let's think about a related question: <i>How can data help us explain why trait variations among beetles and changes in the environment affect which beetles are more likely to survive?</i></p> <p>How would you answer this question based on what we observed in our two desert simulations and the evidence we recorded on our class data tables?</p> <p>NOTE TO TEACHER: <i>Students may find this question difficult to answer, so be prepared to assist students in making the necessary conceptual connections. It may be helpful to suggest one possible response and have students add on.</i></p> <p>ELL support: The complexity of this question may make it difficult for ELL students to understand. Preview the question with students ahead of time, discussing its meaning and possible answers. Building a conceptual foundation will prepare students to engage in the class discussion.</p>	variations matter.	
8 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: Students answer the focus question using data from the desert model to support their ideas. Then the teacher</p>		<p>Today we investigated what happened when a drought caused the beetles' environment to change. Even though the variation in the beetles' color trait didn't change, our simulation results changed, didn't they?</p> <p>Show slide 12.</p>		

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			<p>NOTE TO TEACHER: <i>During this summary, share specific examples of variation in traits from the desert model and include evidence from both class data tables as needed.</i></p>		
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher informs students that in the next lesson, they'll investigate whether trait variations help other living things survive when their environment changes.</p>	Link science ideas to other science ideas.	<p>Show slide 14.</p> <p>Today, we used our desert model to investigate what happens to beetles if their environment changes.</p> <p>We discovered that different colors of beetles survived and were eaten in this environment than in our original environment. This happened even though the beetles' color traits didn't change.</p> <p>Next time, we'll investigate whether trait variations help other kinds of living things survive if their environment changes.</p>		