

Variation in Traits

Lesson 6b: Inherited Traits

Grade 3	Length of lesson: 47 minutes	Placement of lesson in unit: 6b 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 of forest, have an equal chance of surviving?		Lesson focus questions: Do babies of living things have the same traits as their parents? How do you know?
Main learning goal: Living things inherit many traits from their parents.		
Science content storyline: Some living things of the same kind survive longer in their environment than others. Living things that survive long enough can produce young and pass on their traits to the next generation. The traits these babies inherit make them look similar to, but not exactly like, their parents.		
Ideal student response to the focus questions: Living things inherit many traits from their parents. The traits babies inherit from their parents show variation, so the babies look similar to their parents, but not exactly like them.		

Preparation

<p>Materials Needed</p> <ul style="list-style-type: none"> • Science notebooks • Chart paper and markers 	<p>Ahead of Time</p> <ul style="list-style-type: none"> • Review the content background document, especially sections 3 and 4 on variation. • 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 and can follow along and participate. In particular, review key science ideas and orient students to the lesson activities. Introduce the following vocabulary terms: <i>inherited traits</i>, <i>offspring</i> (referred to in previous lessons as <i>babies</i> and <i>young</i>), and <i>information in the bodies of living things</i>. Also include <i>ribs</i> and <i>spine(s)</i> (of cacti) if used in this lesson. Review the words <i>inherit/inheritance</i>, <i>variation(s)</i>, <i>produce young</i>, <i>most likely</i>, and <i>survive long enough</i>.
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Lesson 6b General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
7 min	Link to previous lesson: Students share their drawings of baby cacti from the previous lesson and explain their ideas about whether offspring have the same traits as their parents.	<ul style="list-style-type: none"> • Offspring (babies) of living things of the same kind have traits that are similar to their parents' traits.
1 min	Lesson focus questions: The teacher reviews the focus questions from the previous lesson: <i>Do babies of living things have the same traits as their parents? How do you know?</i>	
6 min	Setup for activity: Students examine a photograph of parents and their offspring (cats and their kittens) and record their observations.	<ul style="list-style-type: none"> • Offspring of living things have some, but not all, of their parents' traits.
10 min	Activity: Students decide whether general statements about trait inheritance are true or false. Then they relate the statements to the photograph of the cats and their kittens.	<ul style="list-style-type: none"> • The traits offspring inherit from their parents make them look similar to, but not exactly like, their parents.
14 min	Follow-up to activity: Using evidence from the photograph of cats and their kittens, students construct a class explanation for why one of the statements about trait inheritance is correct.	<ul style="list-style-type: none"> • Offspring of living things of the same kind have traits that are similar to their parents' traits. But the babies also show variation in some traits, so they don't look exactly like their parents.
8 min	Synthesize/summarize today's lesson: Students write an answer to the focus questions using key science ideas about traits, variation, inheritance, and offspring (babies).	<ul style="list-style-type: none"> • Offspring of living things inherit many traits from their parents, so babies look similar to their parents. But the babies also show variation in some traits, so they don't look exactly like their parents.
1 min	Link to next lesson: The teacher informs students that in the next lesson, they'll apply key science ideas about traits and variation to a new situation.	

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7 min	<p>Link to Previous Lesson</p> <p>Synopsis: Students share their drawings of baby cacti from the previous lesson and explain their ideas about whether offspring have the same traits as their parents.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Offspring (babies) of living things of the same kind have traits that are similar to their parents' traits. 	Link science ideas to other science ideas.	<p>Show slides 1 and 2.</p> <p>In our last lesson, we investigated whether baby animals, like a baby mouse, have the same traits as their parents. Then we thought about the question, <i>Do you think baby plants have the same traits as their parents?</i></p> <p>Take out the pictures you drew showing the traits you thought baby cacti might have.</p> <p>Look at the picture of cacti on this slide. What are some of the parents' traits? What do the parent cacti look like?</p> <p>Those are some good observations of the parents' traits. Now let's look at a few of your drawings of baby cacti and compare them with the photograph of the parent</p>	<p>They have a really tall spike in the middle.</p> <p>They're green.</p> <p>They should have spines, but I can't see them.</p> <p>It looks like they have ribs of some kind, or lines that run up and down along the tall spikes.</p>	

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			<p>cacti.</p> <p>NOTE TO TEACHER: <i>Project two or three student drawings on a document reader. If possible, show drawings that feature different traits (variations).</i></p> <p>ELL support: Review this activity with ELL students ahead of time and give them opportunities to practice responding to questions about their drawings.</p> <p>What traits do you observe in this drawing of the baby cactus? Are these the same as the traits you identified in the parent cacti?</p> <p>Does the baby cactus look exactly like the parents in the photograph? Can you name a variation in a trait?</p>	<p><i>Possible trait variations students might name:</i></p> <ul style="list-style-type: none"> • The color of the baby cactus • The size or spacing of the “ribs” in the spikes • The difference in height between the tallest spike and the smaller spikes around it • The number of the smaller spikes 	

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			<p>In today’s lesson, we’ll continue thinking about whether babies look exactly like their parents.</p> <p>Give me a show of hands. How many of you think the babies of living things look exactly like their parents?</p> <p>How many think they show variation in their traits?</p> <p>NOTE TO TEACHER: <i>Record the results of the show of hands on chart paper for later reference.</i></p> <p>So based on our cacti evidence, it looks as if the babies of living things don’t look exactly like their parents but show some variation in their traits.</p> <p>Let’s do a little more investigating.</p>	that circle the tall spike	
1 min	<p>Lesson Focus Questions</p> <p>Synopsis: The teacher reviews the focus questions from the previous lesson: <i>Do babies of living things have the same traits as their parents? How do you know?</i></p>	Set the purpose with a <u>focus question</u> or goal statement.	<p>Show slide 3.</p> <p>Today’s focus questions are the same as last time: <i>Do babies of living things have the same traits as their parents? How do you know?</i></p> <p>In our last lesson, you predicted the color of the baby of two green beetles; you compared the traits of a baby mouse with</p>		

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			<p>the traits of pairs of adult mice to determine which pair might be the parents; and you drew a picture showing what a baby cactus might look like based on a photograph of parent cacti.</p> <p>Those activities helped us come up with some initial ideas for answering our focus questions.</p> <p>Today we'll build on those ideas as we learn about a new science idea that will help us answer these questions.</p>		
6 min	<p>Setup for Activity</p> <p>Synopsis: Students examine a photograph of parents and their offspring (cats and their kittens) and record their observations.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Offspring of living things have some, but not all, of their parents' traits. 	<p>Make explicit links between science ideas and activities before the activity.</p> <p>Select content representations and models matched to the learning goal and engage students in their use.</p>	<p>Show slide 4.</p> <p>Look at this photograph of parents and their offspring. <i>Offspring</i> is a word scientists use when they talk about the babies of living things.</p> <p>NOTE TO TEACHER: <i>At this point, don't refer to the living things in the photograph as "cats" or "kittens." It's OK if students do, but continue referring to them as "living things" until later in the lesson.</i></p> <p>Turn to a new page in your science notebooks and at the top of the page, write the title "Parents and Their Offspring."</p> <p>Then draw a line down the center of the page so you have two columns. Write</p>		

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			<p>“Parents” at the top of the left-hand column and “Offspring (Babies)” at the top of the right-hand column.</p> <p>NOTE TO TEACHER: <i>Create a sample table on the board or on chart paper that students can use as a model.</i></p> <p>Now look at the photograph again. What do you notice about the parents? What do you notice about the offspring, or babies? For now, just think about the things you observe.</p> <p>NOTE TO TEACHER: <i>Don’t engage students in discussing their observations at this point. Simply have them think silently about these questions as they examine the photograph.</i></p> <p>Now, on a clean page in your science notebooks, make a list of what you noticed about the parents and a list of what you noticed the babies, or offspring. We’ll revisit your lists later.</p> <p>NOTE TO TEACHER: <i>If time is running short, have students list what they notice about the parents and offspring during the activity.</i></p> <p>ELL support: ELL students may benefit from discussing their observations with a shared-language partner before writing</p>		

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			them down.		
10 min	<p>Activity</p> <p>Synopsis: Students decide whether general statements about trait inheritance are true or false. Then they relate the statements to the photograph of the cats and their kittens.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> The traits offspring inherit from their parents make them look similar to, but not exactly like, their parents. 	<p>Make explicit links between science ideas and activities during the activity.</p> <p>Engage students in using and applying key science ideas in a variety of ways and contexts.</p> <p>Engage students in analyzing and interpreting data and observations.</p>	<p>Now that you’ve listed what you noticed about the parents and their offspring in the picture, I’m going to show you three statements one at a time, and I want you to decide whether each statement is true or false.</p> <p>First, at the bottom of the page you labeled “Parents and Their Offspring,” list the numbers 1, 2, and 3 on the left-hand side to represent the three statements.</p> <p>Turn and Talk: After we read each statement together, turn and talk with an elbow partner about whether you think the statement is true or false and why. Then write the letter <i>T</i> for <i>True</i> or <i>F</i> for <i>False</i> next to the appropriate number on your paper.</p> <p>Show slides 5–7 (one at a time).</p> <p>NOTE TO TEACHER: <i>Display each statement on the slides one at a time and have everyone read it. Give students about 30 seconds to talk about each statement with a partner and then write T or F on the page next to the corresponding number in their notebooks. After students have written down their responses for all three statements, ask for a show of hands indicating which statements students think</i></p>		

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			<p><i>are true or false. Record the results on chart paper for review during the activity follow-up.</i></p> <p>Let’s have a show of hands. Who thinks statement 1 is true? Who thinks this statement is false?</p> <p>Who thinks statement 2 is true? Who thinks this statement is false?</p> <p>Who thinks statement 3 is true? Who thinks this statement is false?</p> <p>Show slide 8.</p> <p>Now look at the lists you made earlier describing what you noticed about the parents and the offspring, or babies, in the photograph.</p> <p>Turn and Talk: Share with your partner what you noticed about the parents. Then list on your table under the “Parents” column two or three traits that the parent animals have.</p> <p>Next, share with your partner what you noticed about the offspring or babies. Then list on your table under the “Offspring (Babies)” column two or three traits that the baby animals have.</p> <p>NOTE TO TEACHER: <i>If students are</i></p>		

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			<p><i>struggling with their lists of cat and kitten traits, have them locate handout 6.1 (Mouse Traits) from lesson 6a and review the mice traits. That may give them some ideas.</i></p> <p>Compare your list of the parents' traits with your list of the babies' traits and draw a line connecting any traits the babies have that match the traits of one or both parents.</p> <p>ELL support: If you think vocabulary words may challenge the ability of some ELL students to participate in this part of the lesson, you may want to create handouts showing the traits of parents and offspring and have students or pairs of students circle the traits that are similar and different in different colors (or circle the similarities and draw a box around the differences). Then have them draw lines connecting any traits the babies have that match the traits of one or both parents.</p>		
14 min	<p>Follow-Up to Activity</p> <p>Synopsis: Using evidence from the photograph of cats and their kittens, students construct a class explanation for why one of the statements about trait inheritance is correct.</p> <p>Main science idea(s):</p>	Engage students in constructing explanations and arguments.	<p>Show slide 9.</p> <p>Who can name the living things in this picture?</p> <p>How do you know these living things are cats and kittens?</p> <p>What traits did you list earlier that lets you know they're cats or kittens and not another type of living thing?</p>	<p>They're cats and kittens.</p> <p>They have four legs.</p>	

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	<ul style="list-style-type: none"> Offspring of living things of the same kind have traits that are similar to their parents' traits. But the babies also show variation in some traits, so they don't look exactly like their parents. 		<p>Show slide 10.</p> <p>Let's read our three statements again. As I read each statement, decide whether you think your original answer is right or wrong. If you think it's right, circle it. If you think it's wrong, cross it out and change it.</p> <p>NOTE TO TEACHER: <i>Read each statement again one at a time and give students a few seconds to either confirm or change their answers. Then ask for a show of hands indicating how many students think each statement is true or false. Record the results next to the earlier results you recorded on chart paper. Compare both sets of results and discuss any significant differences. Students should conclude that statement 3 is true and the other two statements are false.</i></p> <p>Show slide 11.</p>	<p>They have fur.</p> <p>They have whiskers.</p> <p>They have flat noses.</p> <p>They have pointy ears.</p>	

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			<p>Our third statement says that the babies of living things have some traits that are like their parents' traits and some traits that are different from their parents' traits.</p> <p>How do you know this statement is true? What is your evidence from the photograph?</p>	<p>The kittens look mostly like the parents, but not exactly like them.</p> <p>The brown-striped kitten looks almost exactly like one of the adults.</p> <p>The other three kittens don't look like either of the parents.</p> <p>I disagree. One of the adults has a white chest, and one of the kittens does too.</p> <p>Their fur is different colors.</p>	<p>Tell me more about not looking exactly like either parent.</p> <p>Does anyone agree or disagree?</p>

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		<p>Highlight key science ideas and focus question throughout.</p> <p>Summarize key science ideas.</p>	<p>What is the key science idea that refers to the differences in a trait among living things of the same kind?</p> <p>We observed that the kittens have some of the same traits as their parents and some traits that are different or show variation. Let's talk about how that happens.</p> <p>Show slide 12.</p> <p>The babies of living things get many traits from their parents. These traits are passed from parents to their offspring through a special kind of information that's carried in the parents' bodies. This information provides instructions for how each baby will look and which of the parents' traits the baby will have.</p> <p>The process of passing traits from parents to their offspring is called <i>inheritance</i>. The traits that parents give their offspring are called <i>inherited traits</i>.</p> <p>Inheritance is an important new science idea, so let's add the words <i>inheritance</i> and <i>inherited</i> to our word wall. Write these words in your science notebooks as well.</p> <p>Show slide 13.</p>	<p>There are different places where they're white and colored.</p> <p>Variation.</p>	

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			<p>What are the inherited traits of the kittens?</p> <p>Which traits of the kittens are variations of the parents' traits?</p>	<p>Fur color.</p> <p>Eye color.</p> <p>Nose color.</p> <p>Markings.</p> <p>The kittens showed variations in their fur color and markings.</p>	
8 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: Students write an answer to the focus questions using key science ideas about traits, variation, inheritance, and offspring (babies).</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Offspring of living things inherit many traits from their parents, so babies look similar to their parents. But the babies also show variation in some traits, so they don't look exactly like their parents. 	<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>Show slide 14.</p> <p>In this lesson, we've continued thinking about the focus questions from last time: <i>Do babies of living things have the same traits as their parents? How do you know?</i></p> <p>Answer these questions in your science notebooks using evidence from today's investigation of the cats and kittens to support your ideas. Include the words <i>trait</i>, <i>variation</i>, <i>inherited</i>, and <i>babies</i> or <i>offspring</i> in your explanations.</p> <p>ELL support: Consider allowing ELL students to work in shared-language groups to develop an answer to these questions. Alternatively, you could provide sentence starters for students to use. You may also want to record students' answers on chart</p>		

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			<p>paper.</p> <p>NOTE TO TEACHER: <i>Instead of having students work on their answers independently, consider giving them a minute or two to think about their ideas and then work together as a group to develop a class response to the focus questions. The answer should reflect the ideal student response on the overview page: Living things inherit many traits from their parents. The traits babies inherit from their parents show variation, so the babies look similar to their parents, but not exactly like them.</i></p> <p>Whole-class share-out: Let’s hear your answers to our focus questions. Make sure to support your ideas with evidence from our cat-and-kitten investigation.</p>		
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher informs students that in the next lesson, they’ll apply key science ideas about traits and variation to a new situation.</p>	Link science ideas to other science ideas.	<p>Show slide 15.</p> <p>In this unit, we’ve learned a lot about how trait variations and the environment affect which living things of the same kind survive long enough to have babies, or offspring.</p> <p>We also discovered that babies inherit traits from their parents that make them look similar to, but not exactly like, their parents.</p>		

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			Next time, you'll bring all of these ideas together and apply them to a new situation.		