

Variations in Plants and Animals

Lesson 4b: Variations in Traits and the Environment Affect the Survival of Cottonwood Trees

Grade 1	Length of lesson: 42 minutes	Placement of lesson in unit: 4b of 5 lessons on variations in plants and animals
Unit central question: How do differences (variations) in plants or animals of the same kind help them survive so they can produce young (babies or seeds)?		Lesson focus question: What helps some cottonwood-tree seeds survive and grow while others don't?
Main learning goal: Trait variations in individual plants and animals of the same kind <i>and</i> variations in the environment affect which plants or animals survive and which don't.		
Science content storyline: Cottonwood-tree seeds aren't exactly the same. For example, some seeds are bigger, and others are smaller. This variation in size affects how far individual seeds will travel on the wind and can determine whether a seed will survive and grow. The environment where the seed lands also influences whether it will survive and grow. So both trait variations <i>and</i> variations in the environment affect which plants or animals will survive and grow. Scientists collect and analyze data (evidence) to find out whether these factors affect which living things survive and which don't.		
Ideal student response to the focus question: Cottonwood-tree seeds aren't exactly the same. Some seeds are large, and some are small. Smaller seeds travel farther on the wind away from the parent tree than bigger seeds. If the seeds land in an open field or another place with soil, sunlight, and rain, they're more likely to survive and grow than if they land in a parking lot or a pond. When seeds land in a place that gives them what they need to survive, they can grow into new cottonwood trees. Cottonwood-tree seeds need to be the right size so the wind will carry them to a good place (environment) where they can survive and grow.		

Preparation

<p>Materials Needed</p> <ul style="list-style-type: none"> • Student notebooks • Chart paper and markers • Optional: <i>The Dandelion Seed's Big Dream</i> by Joseph Anthony (children's book) <p>Student Handouts and Teacher Masters</p> <ul style="list-style-type: none"> • 4.1 Word Wall (Teacher Master) (from lesson 4a) • 4.4 Three Environments (from lesson 4a) • 4.5 Cottonwood-Seed Investigation: Your Predictions (from lesson 4a) • 4.6 Scientists' Data (Teacher Master) 	<p>Ahead of Time</p> <ul style="list-style-type: none"> • Review content background document. • Prepare handout 4.6 (Scientists' Data) for display on a document reader. • Post the butcher-paper results from the cottonwood-seed investigation from lesson 3 for students to use as a reference. • Optional: If you didn't read <i>The Dandelion Seed's Big Dream</i> to students following lesson 4a, review the book and decide whether to read it following this lesson to drive home the importance of the environment in an organism's survival. • ELL support: Meet with ELL students in advance and introduce them to the lesson content, structure, materials, and activities so they know what's expected of them and can participate more fully in the lesson. Identify Tier 2 and 3 words in the lesson plan to review with students in advance, including <i>trait</i>, <i>variation</i>, <i>environment</i>, <i>survive</i>, and <i>survival</i>. Prepare visual resources for these words.
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Lesson 4b General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
4 min	Link to previous lesson: The teacher reviews key science words from the unit and revisits the story about the two cottonwood trees from the previous lesson.	<ul style="list-style-type: none"> Cottonwood-tree seeds don't share all of the same traits. For example, some seeds are big, and others are small. This size variation affects how far cottonwood-tree seeds will travel on the wind and can determine whether an individual seed will survive and grow.
1 min	Lesson focus question: The teacher reviews the focus question from the previous lesson: <i>What helps some cottonwood-tree seeds survive and grow while others don't?</i>	
8 min	Setup for activity: The teacher reviews the word <i>environment</i> . Then students share their predictions from the previous lesson about which cottonwood-tree seeds will land in three different environments.	<ul style="list-style-type: none"> <i>Environment</i> refers to the surroundings where plants or animals live, including the land, air, water, and all other living and nonliving things. The environment where a cottonwood-tree seed lands greatly influences whether or not it will survive and grow. Both trait variations in plants or animals of the same kind <i>and</i> variations in the environment determine whether an individual plant or animal will survive and grow.
10 min	Activity: The teacher introduces scientific data showing where the cottonwood-tree seeds landed. Then students compare the results to their original predictions and discuss which seeds have a better chance of surviving and growing in each of the three environments.	<ul style="list-style-type: none"> Scientists collect and analyze data (evidence) to find out whether trait variations in plants or animals of the same kind <i>and</i> variations in the environment affect which individual plants or animals survive and which don't.
10 min	Follow-up to activity: The teacher poses a challenge in which the locations of the three environments change in relation to the cottonwood trees. Then students predict where the big and small cottonwood-tree seeds will land this time and whether each environment will help the seeds survive and grow.	<ul style="list-style-type: none"> Both trait variations in plants or animals of the same kind <i>and</i> variations in the environment determine whether an individual plant or animal will survive and grow.
8 min	Synthesize/summarize today's lesson: The teacher reviews the focus question and summarizes key ideas from the lesson. Then students imagine being cottonwood seeds and describe the size of seed they would choose to be and the environment where they would want to live.	<ul style="list-style-type: none"> Both trait variations <i>and</i> variations in the environment determine which plants or animals of the same kind will survive and which won't.
1 min	Link to next lesson: The teacher announces that in the next lesson, students will use what they've learned about traits, variations, survival, and environments to figure out which trait variations will help dandelions survive in a city park.	

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4 min	<p>Link to Previous Lesson</p> <p>Synopsis: The teacher reviews key science words from the unit and revisits the story about the two cottonwood trees from the previous lesson.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Cottonwood-tree seeds don't share all of the same traits. For example, some seeds are big, and others are small. This size variation affects how far cottonwood-tree seeds will travel on the wind and can determine whether an individual seed will survive and grow. 	Highlight key science ideas and focus question throughout.	<p>Show slides 1 and 2.</p> <p>In our last lesson, you predicted which cottonwood seeds will land in three different environments near two cottonwood trees. The environment closest to the trees is a parking lot. Farthest from the trees is an open field, and between the parking lot and the trees is a pond.</p> <p>Before we talk about your predictions, let's read aloud the science words we've been learning about in this unit.</p> <p>NOTE TO TEACHER: <i>Ask students to read the words on the slide aloud.</i></p> <p>What is one trait of a cottonwood-tree seed we've been exploring?</p> <p>What are two variations of that trait?</p> <p>Show slide 3.</p> <p>Now let's revisit our story from last time.</p> <p>What was our story about?</p> <p>What three environments were located near these two trees?</p>	<ul style="list-style-type: none"> • Trait. • Variations. • Survive. • Environment. <p>Size.</p> <p>Big and small.</p> <p>Two cottonwood trees.</p> <p>A parking lot.</p>	

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			<p>What did we learn about the cottonwood-tree seeds in the story?</p> <p>What happened to the seeds at the end of the story?</p> <p>That’s right! The wind blew the seeds away from the cottonwood trees.</p> <p>The story didn’t tell us where the seeds went or how far the wind carried them, so we made some predictions about what might happen to them.</p> <p>In a few minutes, we’ll revisit your predictions, and then we’ll find out what actually happened to the seeds.</p>	<p>A pond.</p> <p>A field.</p> <p>The parking lot.</p> <p>The field.</p> <p>Some seeds were big, and some were small.</p> <p>The wind blew them away!</p>	<p>Which environment was closest to the trees?</p> <p>Which was farthest away?</p>
1 min	<p>Lesson Focus Question</p> <p>Synopsis: The teacher reviews the focus question from the previous lesson:</p>	Set the purpose with a <u>focus</u>	<p>Show slide 4.</p> <p>Today’s focus question is the same as last time: <i>What helps some cottonwood-tree</i></p>		

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	<i>What helps some cottonwood-tree seeds survive and grow while others don't?</i>	<p><u>question</u> or goal statement.</p> <p>Link science ideas to other science ideas.</p>	<p><i>seeds survive and grow while others don't?</i></p> <p>In this lesson, we'll add to our ideas about how variations in the size trait of cottonwood-tree seeds can help some seeds survive and grow. We'll also think about how the environment affects which seeds survive and which don't.</p>		
8 min	<p>Setup for Activity</p> <p>Synopsis: The teacher reviews the word <i>environment</i>. Then students share their predictions from the previous lesson about which cottonwood-tree seeds will land in three different environments.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> <i>Environment</i> refers to the surroundings where plants or animals live, including the land, air, water, and all other living and nonliving things. The environment where a cottonwood-tree seed lands greatly influences whether or not it will survive and grow. Both trait variations in plants or animals of the 	Summarize key science ideas.	<p>Show slide 5.</p> <p>Who can tell me what we mean when we talk about an environment? What is an environment?</p> <p>That's right! An environment is anything that surrounds a living thing. The land, air, water, and other living and nonliving things are all part of the environment.</p> <p>What did we say the cottonwood-tree seeds need to survive and grow?</p> <p>So what kind of environment do you think is better for the seeds? Why?</p>	<p>An environment is everything that's around a plant, like land, water, air, and other plants and animals.</p> <p>They need dirt, sunlight, and rain to survive.</p> <p>An environment that has dirt, sunlight, and rain is better for the seeds because these things help</p>	

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	<p>same kind <i>and</i> variations in the environment determine whether an individual plant or animal will survive and grow.</p>	<p>Ask questions to elicit student ideas and predictions.</p>	<p>Show slide 6.</p> <p>Next, we'll talk about your predictions from last time. Find the handout where you wrote your predictions and look at what you thought would happen to the seeds. Then look at the handout showing the three environments and look at where you put your sticky notes.</p> <p>NOTE TO TEACHER: <i>Have students locate handouts 4.4 (Three Environments) and 4.5 (Cottonwood-Seed Investigation: Your Predictions) from lesson 4a. Then have them look at their predictions and where they placed their sticky notes to show where the big and small seeds might land.</i></p> <p>What did you predict will happen to the big cottonwood-tree seeds when the wind blows them away? Where do you think they'll land?</p> <p>ELL support: Encourage ELL students to respond directly to each other's ideas. This will help them build understandings of the science concepts as a community of learners.</p>	<p>them survive and grow.</p> <p>I predicted that they land in the parking lot close to the trees.</p> <p>Because they're heavier than the small seeds, and they can't travel as far.</p>	<p>Why do you think the big seeds will land in the parking lot?</p>

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			<p>What did you predict will happen to the small cottonwood-tree seeds? Where do you think they'll land?</p> <p>Did anyone show some of the seeds landing in the pond?</p> <p>Which of the three environments do you think would be better for the seeds? Why?</p>	<p>I think they'll land in the field.</p> <p>Because they're really light, so the wind will blow them farther away.</p> <p>I showed one large seed and a few small seeds in the pond.</p> <p>I think the field is better for the seeds.</p> <p>Because the field has more sun.</p> <p>I think the pond is better for the seeds?</p>	<p>Why do you think the small seeds will land in the field?</p> <p>Why do you think some of the seeds will land in the pond?</p> <p>Why do you think that?</p> <p>Does anyone have a different idea?</p> <p>Why did you think that?</p>

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		<p>Make explicit links between science ideas and activities before the activity.</p>	<p>Thank you for sharing your ideas and predictions! Now let's find out whether your predictions match what happened to the seeds.</p>	<p>Because the pond has lots of water, and seeds need water to grow.</p>	
10 min	<p>Activity</p> <p>Synopsis: The teacher introduces scientific data showing where the cottonwood-tree seeds landed. Then students compare the results to their original predictions and discuss which seeds have a better chance of surviving and growing in each of the three environments.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Scientists collect and analyze data (evidence) to find out whether trait variations in plants or animals of the same kind <i>and</i> variations in the environment affect which individual plants or animals survive and 	<p>Make explicit links between science ideas and activities during the activity.</p> <p>Engage students in analyzing and interpreting data and observations.</p> <p>Engage students in constructing explanations and arguments.</p>	<p>Show slide 7.</p> <p>Here's what scientists discovered when they looked at how far the small and big cottonwood-tree seeds traveled from the edge of the forest.</p> <p>NOTE TO TEACHER: <i>In addition to the slide, display handout 4.6 (Scientists' Data) on a document reader. Make sure students at the back of the classroom can read the data.</i></p> <p>What do you notice about the scientists' data? Remember that the <i>B</i> on the chart represents the big seeds, and the <i>S</i> represents the small seeds.</p> <p>NOTE TO TEACHER: <i>Help students look at the data holistically rather than seed by seed. Do they see more small seeds in the open field and more big seeds in the parking lot or pond? Do their predictions reflect the data?</i></p>	<p>Only big seeds landed in the parking lot.</p>	

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	which don't.		<p> Listen to students' ideas. What's visible about student thinking?</p> <p>What else do you notice?</p> <p>So what do the data tell you about how far the cottonwood seeds travel?</p> <p>Now look at the predictions you wrote on your handouts and compare them with what the scientists found.</p> <p>ELL support: It might be helpful for ELL students to share their ideas with a partner in their home languages before sharing their ideas in English with the class.</p> <p>Did your predictions match the scientists' data? Why or why not?</p> <p>Give me a show of hands. Who predicted that most of the big cottonwood seeds would land in the parking lot?</p> <p>Who predicted that most of the small</p>	<p>More big seeds than small seeds landed in the pond.</p> <p>Most of the small seeds landed in the field, and only one big seed did.</p> <p>Smaller seeds travel farther than bigger seeds.</p>	

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			<p>cottonwood seeds would land in the field?</p> <p>Who predicted that some big and small seeds would land in the pond?</p> <p>Did the big cottonwood seeds land in an environment where they can survive and grow? Why or why not?</p> <p>ELL support: To help ELL students track the conversation, ask one question at a time, or limit the number of questions to simplify the discussion.</p> <p>Did the small cottonwood seeds land in an environment where they can survive and grow? Why or why not?</p> <p>Which of the three environments gives the seeds a better chance of surviving and growing? Why do you think so?</p>		
10 min	<p>Follow-Up to Activity</p> <p>Synopsis: The teacher poses a challenge in which the locations of the three environments change in relation to the cottonwood trees. Then students predict where the big and small cottonwood-tree seeds will land this time and whether each</p>	<p>Make explicit links between science ideas and activities after the activity.</p> <p>Engage students in</p>	<p>Show slide 8.</p> <p>What have we learned so far about the big and small cottonwood-tree seeds? When the wind blows the seeds, will the bigger ones or the smaller ones travel the greatest distance from the tree?</p> <p>Yes, the smaller cottonwood seeds will travel the farthest from the tree.</p> <p>But is that always a good thing?</p>	<p>The smaller ones will go the farthest.</p>	

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	<p>environment will help the seeds survive and grow.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Both trait variations in plants or animals of the same kind <i>and</i> variations in the environment determine whether an individual plant or animal will survive and grow. 	<p>analyzing and interpreting data and observations.</p> <p>Engage students in using and applying new science ideas in a variety of ways and contexts.</p> <p>Ask questions to elicit student ideas and predictions.</p>	<p>Raise your hands if you think it's always good for cottonwood seeds to travel the farthest from the tree.</p> <p>Why do you think so?</p> <p>Show slide 9.</p> <p>Now I have a challenge for you.</p> <p>Look at our two cottonwood trees again. One tree has big seeds and one tree has small seeds just like before. But something's different about this picture. Look closely at the three environments. What do you notice?</p> <p>Which environment is closest to the trees this time?</p> <p>Which environment is farthest from the trees?</p> <p>Which environment is in the middle this time?</p> <p>Show slide 10.</p> <p>So when the wind blows the seeds away from the trees, where do you think the <i>big</i> cottonwood seeds will land this time? How do you know?</p>	<p>They're in different places this time!</p> <p>The field.</p> <p>The pond.</p> <p>The parking lot.</p> <p>I think more of the big seeds will land</p>	

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		Engage students in constructing explanations and arguments.	<p>Do you think this environment will help the bigger seeds survive and grow? Why or why not?</p> <p>Where do you think the <i>small</i> cottonwood seeds will land this time? Why?</p> <p>Do you think this environment will help the smaller seeds survive and grow? Why or why not?</p>	<p>in the field this time because they're too heavy to travel very far.</p> <p>I think the bigger seeds will survive in the field because they're stronger.</p> <p>I think more of the small seeds will land in the pond this time because they can travel farther than the big seeds.</p> <p>I think they'll survive because the pond has water they need, and they'll get sunlight, too.</p> <p>I don't think they'll</p>	<p>What do you mean by "stronger"?</p> <p>How would being stronger help the bigger seeds survive?</p> <p>Does anyone have a different idea?</p>

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		Summarize key science	<p>In which of these environments do you think the cottonwood-tree seeds would have a better chance of surviving and growing into new cottonwood trees? Why do you think so?</p> <p>Does someone have a different idea?</p> <p>So what have we learned about variations in the size trait of cottonwood seeds? Does the size of the seeds make a difference in their survival? Why?</p> <p>But what if the smaller seeds blow far away and land in a parking lot? Will they still survive and grow?</p> <p>Show slide 11.</p> <p>Let's review what we've learned from our</p>	<p>survive because the pond doesn't have any soil, and that's one of the things seeds need to grow.</p> <p>Yes, the size of the seeds matters because the smaller seeds travel farther from the tree and have more space to grow. They also get more sun and rain.</p> <p>No, because they need dirt to grow.</p>	

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		<p>ideas.</p> <p>Link science ideas to other science ideas.</p>	<p>cottonwood-seed investigations so far. One important idea we've learned about is that the size of cottonwood seeds is important for their survival. Smaller cottonwood-tree seeds have a better chance of surviving because they can travel farther from the parent tree. But the seeds also need a good environment to survive and grow.</p> <p>So variations in a trait are important for the survival of cottonwood seeds. But the environment is important for their survival too, isn't it?</p>		
8 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: The teacher reviews the focus question and summarizes key ideas from the lesson. Then students imagine being cottonwood seeds and describe the size of seed they would choose to be and the environment where they would want to live.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Both trait variations <i>and</i> variations in the environment determine which plants or animals of the same kind will survive and which 	Highlight key science ideas and focus question throughout.	<p>Show slide 12.</p> <p>Today we've been thinking more about our focus question from last time: <i>What helps some cottonwood-tree seeds survive and grow while others don't?</i></p> <div data-bbox="869 987 947 1062" style="display: inline-block; vertical-align: middle;">  </div> <p style="margin-left: 20px;"><i>Embedded Assessment Task</i></p> <p>Who can tell me one thing that helps some cottonwood-tree seeds survive and grow?</p> <p>What else helps some cottonwood-tree seeds survive and grow?</p>	<p>Being smaller.</p> <p>The environment where they land.</p>	<p>Why does being smaller help some cottonwood seeds survive and grow?</p> <p>Why does the</p>

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	won't.	<p>Summarize key science ideas.</p> <p>Engage students in constructing explanations and arguments.</p>	<p>So the smaller variation in the size trait helps cottonwood seeds survive because they can travel farther on the wind. And the environment where they land also helps them survive if it provides what they need, like soil, sunlight, and rain.</p> <p>Show slide 13.</p> <p>Now I'd like you to imagine that you're a cottonwood-tree seed.</p> <p>Which size would you choose to be—big or small? Where would you want to land—in a parking lot, a pond, or a field?</p> <p>Open your notebooks and draw a picture of yourself as a big or small cottonwood-tree seed. Then draw the environment where you would like to land.</p> <p>After you finish your pictures, explain in complete sentences why you chose that size of seed and why you would want to land in one of the three environments. Use the sentence starters on the slide to help you construct your explanations:</p> <p><i>I would choose to be a [big/small] cottonwood-tree seed, because _____.</i></p>		environment help some of the seeds survive and grow?

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			<p><i>I would want to land in a [parking lot/pond/field] because _____.</i></p> <p>Support your reasons with evidence from our cottonwood-seed investigations. And be ready to share your pictures and answers with the class.</p> <p>Whole-class share-out: Who would like to share your pictures and sentences? What size cottonwood-tree seed would you choose to be, and where would you want to land? Make sure to explain why!</p> <p>NOTE TO TEACHER: <i>Display students' drawings on a document reader as they share their ideas and reasoning.</i></p>		
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher announces that in the next lesson, students will use what they've learned about traits, variations, survival, and environments to figure out which trait variations will help dandelions survive in a city park.</p>	Link science ideas to other science ideas.	<p>Show slide 14.</p> <p>In our next lesson, you'll use what you've learned so far about traits, variations, survival, and environments to figure out which traits and variations will help dandelions survive in a city park.</p>		