

Variations in Plants and Animals

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

Grade 1	Length of lesson: 37 minutes	Placement of lesson in unit: 4a 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 or 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 • Sticky notes (Students will use a crayon or marker to label each sticky note with a <i>B</i> for big or an <i>S</i> for small. They they'll use the notes to show on handout 4.4 where they think the cottonwood-tree seeds will land.) • 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) (laminated, 11 × 17") • 4.2 Cottonwood Trees (Teacher Master) • 4.3 Cottonwood Seeds Blowing (Teacher Master) • 4.4 Three Environments (1 per student) • 4.5 Cottonwood-Seed Investigation: Your Predictions (1 per student) 	<p>Ahead of Time</p> <ul style="list-style-type: none"> • Review the content background document. • Display the butcher-paper results from the cottonwood-seed investigation from lesson 3 for students to use as a reference. • Optional: Review <i>The Dandelion Seed's Big Dream</i> and decide whether to read the book to students 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. Display language resources, including key words for the word wall from handout 4.1, and prepare visual resources. Identify words in the lesson plan to review with students in advance, including <i>environment, survive, survival, investigation/investigate, model, represent, and predict/prediction.</i>
---	--

Lesson 4a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	Link to previous lesson: The teacher engages students in reviewing key ideas about traits, variations, and survival from the cottonwood-seed investigation.	<ul style="list-style-type: none"> Cottonwood-tree seeds aren't exactly the same. Some seeds are big, and others are small. This variation in size affects how far individual seeds can travel on the wind and whether they will survive and grow.
1 min	Lesson focus question: The teacher introduces the focus question, <i>What helps some cottonwood-tree seeds survive and grow while others don't?</i>	
6 min	Setup for activity: The teacher discusses what the word <i>environment</i> means. Then students think about the kind of environment that might help living things like cottonwood-tree seeds survive and grow.	<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.
10 min	Activity: The teacher tells students a story about two cottonwood trees and their seeds. The wind carries the seeds over three different environments: a parking lot, a pond, and an open field. Students predict where the seeds will land and which environment will help them 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 their environment determine which individual plants or animals survive and grow and which don't.
8 min	Follow-up to activity: Students share their predictions about where the cottonwood-tree seeds will land and which of the three environments will help them survive and grow.	
6 min	Synthesize/summarize today's lesson: The teacher reviews the focus question; then students consider how the story about the cottonwood-tree seeds and the three environments might help them answer it.	
1 min	Link to next lesson: The teacher announces that in the next lesson, students will find out what happened to the cottonwood-tree seeds and whether their predictions match the data.	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
5 min	<p>Link to Previous Lesson</p> <p>Synopsis: The teacher engages students in reviewing key ideas about traits, variations, and survival from the cottonwood-seed investigation in the previous lesson.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Cottonwood-tree seeds aren't exactly the same. Some seeds are big, and others are small. This variation in size affects how far individual seeds can travel on the wind and whether they will survive and grow. 	<p>Link science ideas to other science ideas.</p> <p>Make explicit links between science ideas and activities.</p>	<p>Show slides 1 and 2.</p> <p>In our last two lessons, we used a model to investigate how far cottonwood-tree seeds travel when the wind blows them.</p> <p>What did we use to represent the cottonwood-tree seeds?</p> <p>Which <i>trait</i> did we investigate?</p> <p>Which <i>variations</i> in this trait did we explore?</p> <p>Who can use our science words in complete sentences to describe what we did in our investigation?</p> <p>ELL support: Give ELL students several examples of what it means to speak in a complete sentence.</p> <p>Which size variation do you think might help cottonwood-tree seeds survive and grow into big cottonwood trees?</p>	<p>Cotton balls.</p> <p>The size of the seeds.</p> <p>Big seeds and small seeds.</p> <p>We looked at the trait of size in cottonwood-tree seeds and variations in that trait. Our model showed how far big and small seeds travel when the wind blows them.</p> <p>The small seeds traveled farther from the parent tree, so</p>	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		Summarize key science ideas.	<p>So based on our investigation, we think that the smaller cottonwood-tree seeds have a better chance of surviving than larger seeds because they travel farther from the parent tree.</p> <p>Today we'll add to our ideas about what helps cottonwood-tree seeds survive so they can grow into new trees.</p>	they're more likely to survive and grow into new trees.	
1 min	<p>Lesson Focus Question</p> <p>Synopsis: The teacher introduces the focus question, <i>What helps some cottonwood-tree seeds survive and grow while others don't?</i></p>	Set the purpose with a <u>focus question</u> or goal statement.	<p>Show slide 3.</p> <p>Our focus question for this lesson is <i>What helps some cottonwood-tree seeds survive and grow while others don't?</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 the lesson.</i></p> <p>Show slide 4.</p> <p>What we learn will help us gather more evidence to answer our unit central question, <i>How do differences (variations) in plants or animals of the same kind help them survive so they can produce young (babies or</i></p>		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<i>seeds)?</i>		
6 min	<p>Setup for Activity</p> <p>Synopsis: The teacher discusses what the word <i>environment</i> means. Then students think about the kind of environment that might help living things like cottonwood-tree seeds survive and grow.</p> <p>Main science idea(s): <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.</p>	<p>Make explicit links between science ideas and activities before the activity.</p> <p>Ask questions to elicit student ideas and predictions.</p>	<p>For today’s activity, I’m going to tell you a story about two cottonwood trees, and you’ll predict what will happen to their seeds.</p> <p>Show slide 5.</p> <p>But first, let’s look at this photo of some cottonwood trees.</p> <p>Who can describe the place where these trees live?</p> <p>NOTE TO TEACHER: <i>As students share their observations, record them on chart paper. Encourage students to notice everything around the trees, such as grass, water, soil, birds, rocks, flowers, and other trees or plants.</i></p> <p>Each of the things you just described is part of the trees’ <i>environment</i>.</p> <p>NOTE TO TEACHER: <i>If you haven’t already added the word environment to the word wall, do so now.</i></p> <p>Show slide 6.</p> <p>What do you think the word <i>environment</i> means? Who can describe it in your own words?</p>	<p>It’s grassy.</p> <p>The trees are growing next to a pond.</p> <p>It’s everything</p>	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		Summarize key science ideas.	<p>Show slide 7.</p> <p>That’s right! An environment includes everything that surrounds a living thing. The land, air, water, and other living and nonliving things are all part of the environment.</p> <p>How would you describe our classroom environment?</p> <p>What about the environment around our school?</p> <p>ELL support: Encourage ELL students to respond to one another’s ideas. It might be useful to create a labeled drawing from this discussion so that students have a visual</p>	<p>around a plant or animal.</p> <p>The land, the air, water, and other plants and animals.</p> <p>We have desks and chairs.</p> <p>We have walls and a floor.</p> <p>We have windows.</p> <p>We have air.</p> <p>Trees.</p> <p>A grassy field.</p> <p>A playground.</p>	Can you tell us what some of those things are?

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			resource to use with environment-related words.	Sidewalks. Dirt. Air. Sunlight. Bushes and flowers.	
10 min	<p>Activity</p> <p>Synopsis: The teacher tells students a story about two cottonwood trees and their seeds. The wind carries the seeds over three different environments: a parking lot, a pond, and an open field. Students predict where the seeds will land and which environment will help them 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 their environment determine which individual 	<p>Make explicit links between science ideas and activities during the activity.</p> <p>Engage students in using and applying new science ideas in a variety of ways and contexts.</p>	<p>Now listen carefully as I tell you a story about two cottonwood trees and their seeds. Afterward, you'll use what you already know about cottonwood-tree seeds to predict what will happen to the seeds in our story.</p> <p>Show slide 8.</p> <p>Two cottonwood trees live side by side at the edge of a forest. It's late in the summer, and the trees have produced a lot of seeds that hang from their branches. One cottonwood tree produces small seeds, and the other cottonwood tree produces big seeds. All the seeds need is a strong gust of wind to come along and carry them away.</p> <p>NOTE TO TEACHER: <i>If it seems appropriate, refer to the cotton-ball investigation from lesson 3 at different points in the story to help students make connections to previous science ideas.</i></p>		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	<p>plants or animals survive and grow and which don't.</p>	<p>Ask questions to elicit student ideas and predictions.</p>	<p><i>Explain that the wind is stronger than the air from a fan, so the actual cottonwood-tree seeds will travel farther than the cotton balls did in the investigation.</i></p> <p>Show slide 9.</p> <p>All of a sudden, the wind starts to blow, and the seeds take off! Where are they headed? How far will they fly?</p> <p>Show slide 10.</p> <p>Not far from the edge of the forest are three very different environments: a parking lot, a pond, and an open field. The parking lot is closest to the edge of the forest, the pond is a little farther away, and the open field is just beyond the pond.</p> <p>Which of the cottonwood-tree seeds will land in a place where they can survive and grow into new cottonwood trees?</p> <p>Look at the picture of the three environments near the forest. Let's name them together: a parking lot, a pond, and an open field.</p> <p>Where do you think the <i>small</i> cottonwood-tree seeds will land when the wind blows them away? Where do you think the <i>big</i> cottonwood-tree seeds will land?</p>		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<p>Turn and Talk: Think about these questions for a moment and then share your ideas and reasons with an elbow partner.</p> <p>NOTE TO TEACHER: <i>The purpose of this Turn and Talk is to help students prepare to make their own predictions about what will happen to the seeds. As you circulate around the room, listen to students' ideas. Remind students to think about the cotton-ball investigation in lesson 3. Don't correct students or probe their thinking at this time. Simply jot down any interesting ideas to discuss later with the class.</i></p> <p>ELL support: Highlighting the ideas of ELL students can give them epistemic authority and encourage their participation. Repeat the ideas students share and then have the class investigate these ideas together at a later time.</p> <p> Listen to students' ideas. What's visible about student thinking?</p> <p>Next, you'll show on a handout where you think the big and small cottonwood-tree seeds will land.</p> <p>NOTE TO TEACHER: <i>Distribute handout 4.4 (Three Environments) and sticky notes. Have students use a crayon or marker to label some sticky notes with a B (for big)</i></p>		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<p><i>and some with an S (for small). They'll stick the notes on the handout to show where they think the cottonwood-tree seeds will land.</i></p> <p>On your handout, find the environment that is closest to the cottonwood trees. Who can tell me what that environment is? What does it say on the handout?</p> <p>Who can tell me which environment is farthest away from the trees?</p> <p>Which environment is in the middle?</p> <p>Show slide 11.</p> <p>Next, you'll talk with your partner about where you think the <i>big</i> cottonwood seeds will land. Will they land close to the trees in the parking lot? Will they land in the pond, or will they land farther away in the field? Think about what happened in our model with the big cotton balls.</p> <p>When you decide where you think the larger seeds will land, mark these places on your handouts using the sticky notes with the <i>B</i> on them.</p> <p>ELL support: To help orient ELL students to the activity, review distance words and/or provide visual cues.</p>	<p>It's a parking lot.</p> <p>The field.</p> <p>The pond.</p>	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<p>When you finish putting these sticky notes on the handout, talk with your partner about where you think the <i>small</i> cottonwood seeds will land. Will they land in the parking lot closer to the trees, in the pond, or farther away in the field? Think about where the small cotton balls landed in our fan experiment.</p> <p>When you decide where you think the smaller seeds will land, mark these places on your handouts using the sticky notes with the S on them.</p> <p>Student work time.</p> <p>Show slide 12.</p> <p>Now let's think about which seeds have a better chance of surviving in the environment where they land.</p> <p>NOTE TO TEACHER: <i>Distribute handout 4.5 (Cottonwood-Seed Investigation: Your Predictions) and go over the instructions with students. You may also want to have students glue the handout into their science notebooks.</i></p> <p>Do you think the bigger cottonwood seeds or the smaller seeds are more likely to survive and grow in their environment?</p>		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<p>Turn and Talk: Talk about this question with your partner. Then complete the sentence on your handout:</p> <p><i>I predict that more of the [bigger or smaller] cottonwood-tree seeds will survive and grow because _____.</i></p> <p>Make sure to circle the word <i>bigger</i> or <i>smaller</i> to show which seeds you think will survive and grow. Be ready to share your predictions and reasoning with the class.</p> <p>NOTE TO TEACHER: <i>Circulate around the room during the Turn and Talk and listen carefully to students' ideas and reasoning. Don't probe or challenge their thinking at this point, but jot down any ideas or misconceptions to address during the class discussion. As students work on their predictions, encourage them to use the vocabulary terms on the handout and/or word wall (e.g., small cottonwood-tree seeds, big cottonwood-tree seeds, wind, environment, trait, survive and grow) and include evidence from the previous lesson to support their ideas.</i></p> <p> Listen to students' ideas. What's visible about student thinking?</p>		
8 min	Follow-Up to Activity		Show slide 13.		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	<p>Synopsis: Students share their predictions about where the cottonwood-tree seeds will land and which of the three environments will help them 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 their environment determine which individual plants or animals survive and grow and which don't. 	<p>Make explicit links between science ideas and activities after the activity.</p> <p>Engage students in constructing explanations and arguments.</p>	<p>Whole-class share-out: Who would like to share your predictions about which seeds will survive and grow in their environment? Make sure to use the sentence starter on the slide.</p> <p>NOTE TO TEACHER: <i>During this discussion, encourage students to refer to the vocabulary terms on the handout and/or word wall (e.g., small cottonwood-tree seeds, big cottonwood-tree seeds, wind, environment, trait, survive and grow) and use evidence from the previous lesson to support their ideas.</i></p>	<p>I predict that more of the <i>bigger</i> cottonwood-tree seeds will survive and grow because the bigger seeds are stronger.</p> <p>I predict that more of the <i>smaller</i> cottonwood tree seeds will survive and grow because they can travel farther than the bigger seeds.</p> <p>Because the smaller cotton balls went farther when the fan</p>	<p>What do you mean by “stronger?” How would being stronger help the bigger seeds survive and grow?</p> <p>How do you know the smaller seeds will travel farther? What’s your evidence?</p>

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<p>Where did you put the sticky notes with the <i>B</i> to show where you think the bigger cottonwood seeds will land?</p> <p>NOTE FOR TEACHER: <i>Considers using a document reader to project some of the predictions students wrote on handout 4.5 and where they placed their sticky notes on handout 4.4. Help students look at the data holistically rather than seed by seed. Do they see more of the S sticky notes in the open field and more of the B sticky notes in the parking lot or pond? Were students' predictions similar?</i></p> <p><i>Ask students to explain the reasons for their predictions and support their ideas with evidence from the cotton-ball model.</i></p> <p><i>Help students link the science ideas that some trait variations give plants or animals of the same kind a survival advantage, especially in particular environments. Work toward this big idea throughout the unit.</i></p> <p>Did anyone put your <i>B</i> sticky notes somewhere else?</p>	<p>blew them.</p> <p>I put my <i>B</i> sticky notes in the parking lot.</p> <p>I put my <i>B</i> sticky notes in the pond.</p>	<p>How would traveling farther help the small seeds survive and grow?</p> <p>Why did you put your <i>B</i> sticky notes in the parking lot?</p> <p>What do you think will happen to the big cottonwood seeds in the parking lot? Will they grow and survive?</p>

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			<p>Where did you place your sticky notes with the <i>S</i> to show where you think the <i>small</i> cottonwood-tree seeds will land?</p> <p>Did anyone put your <i>S</i> sticky notes somewhere else?</p>	<p>I put my <i>S</i> sticky notes in the field.</p> <p>I put my <i>S</i> sticky notes in the pond.</p>	<p>Why did you put your <i>B</i> sticky notes in the pond?</p> <p>Do you think the seeds will survive and grow there? Why?</p> <p>Why do you think the small seeds will land in the field?</p> <p>Do you think the seeds can survive and grow in the field? Why?</p> <p>Why do you think the small seeds will land in the pond? Do you think they can grow and survive there?</p>
6 min	Synthesize/Summarize Today's Lesson		Show slide 14.		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	<p>Synopsis: The teacher reviews the focus question; then students consider how the story about the cottonwood-tree seeds and the three environments might help them answer it.</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 their environment determine which individual plants or animals survive and grow and which don't. 	<p>Make explicit links between science ideas and activities.</p> <p>Highlight key science ideas and focus question throughout.</p> <p>Ask questions to elicit student ideas and predictions.</p>	<p>Today I told you a story about two cottonwood trees at the edge of a forest and how the wind blew the cottonwood seeds away. Then we talked about the three very different environments where the seeds could land, and you predicted which seeds would land in each environment. We also thought about whether the seeds will survive and grow in these different environments.</p> <p>Show slide 15.</p> <p>Remember our focus question, <i>What helps some cottonwood-tree seeds survive and grow while others don't?</i></p> <p> <i>Embedded Assessment Task</i></p> <p>After hearing the story about the cottonwood-tree seeds and the three environments, what ideas do you have now for answering this question?</p>		
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher announces that in the next lesson, students will find out what happened to the cottonwood-tree seeds and whether their</p>	<p>Link science ideas to other science ideas.</p>	<p>Show slide 16.</p> <p>In our next lesson, we'll look at some data scientists collected that will show where the cottonwood-tree seeds landed.</p> <p>Do you think your predictions will match the</p>		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	predictions match the data.		scientists' data?		