

Plants and Animals

Lesson 3d.2: Investigating What Plants Need

Grade: Kindergarten	Length of lesson: 45 minutes	Placement of lesson in unit: 3d.2 of 6 lessons on plants and animals
Unit central question: Do plants and animals need the same things to live and grow? Explain your thinking.		Lesson focus questions: Do plants need soil to live and grow? What is your evidence?
Main learning goal: Many plants have soil in their environment, but not all plants need soil to live and grow.		
Science content storyline: To find out what plants need to live and grow, we set up two experiments to test our ideas about whether plants need water and light. We also set up an experiment to test our ideas about whether plants need soil to live and grow. When we observed seeds planted with and without soil, we found out that seeds can grow when they're planted in moist paper towels instead of soil. We also looked at different examples of plants and found out that some plants live their entire lives hanging in the air or floating underwater without any soil at all. So not all plants need soil to live and grow.		
Ideal student response to the focus questions: Not all plants need soil to live and grow. Some plants live their entire lives hanging in the air or floating underwater their entire lives without any soil at all! Some seeds can even grow on cotton balls or paper towels as long as they have water, light, and air.		

Preparation

<p>Materials Needed</p> <ul style="list-style-type: none"> • Science notebooks • Chart paper and markers • Circle map from lesson 3a (“Our Beginning Ideas: What Do Plants Need to Live and Grow?”) • Class evidence chart (tree map) from lesson 3d.1 (“Do Plants Need Soil?”) <p>Student Handouts</p> <ul style="list-style-type: none"> • 3.13 Do Plants Need Soil to Live and Grow? (1 per student) 	<p>Ahead of Time</p> <ul style="list-style-type: none"> • Review section 4 in the content background document, focusing on what plants need. • Review Common Student Ideas about Plants and Animals, focusing on student ideas about plants. • 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. In particular, you may want to discuss the images of non-soil-based plants with the students and help them understand the information they contain. Identify vocabulary terms in the lesson plan to review with students in advance, including <i>experiment</i>, <i>prediction/predict</i>, <i>claim</i>, <i>evidence</i>, the verb <i>record</i>, <i>air plants</i>, and <i>elodea plants</i>. Post any new vocabulary terms and definitions on a word wall for easy reference. Also have students record these terms in their science notebooks and in their picture dictionary if they’ve made one.
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Lesson 3d.2: General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	Link to previous lesson: The teacher engages students in summarizing the purposes of their plant experiments and what they've discovered so far.	<ul style="list-style-type: none"> We have many ideas about what plants and animals need to live and grow. The experiments we're conducting will help us find out whether plants need light, water, and soil. Many of us think that plants need soil because we see plants growing in soil, and we plant seeds in soil.
1 min	Lesson focus questions: The teacher introduces the focus questions, <i>Do plants need soil to live and grow? What is your evidence?</i>	
6 min	Setup for activity: Working in pairs, students observe the seeds they planted with and without soil and look for evidence to help them answer the question, "Do plants need soil?" Then pairs share their observations with the class, and the teacher records their evidence on a tree map.	<ul style="list-style-type: none"> We set up our soil experiment to test our idea that plants need soil to live and grow. Many of us think that plants need soil because we see them growing in soil, and we plant seeds in soil. The evidence we've collected so far shows that our seeds without soil are growing just like the seeds with soil.
15 min	Activity: Students study pictures of different plants growing without soil (air plants, aquarium plants, and seeds grown in paper toweling or cotton balls) and learn about each plant. Then they share evidence that the teacher adds to their tree map.	<ul style="list-style-type: none"> Some plants, such as air plants and aquarium plants, can live and grow without any soil at all. Seeds can also sprout and grow in moist paper towels or cotton balls instead of soil.
15 min	Follow-up to activity: Students work in pairs to make claims about whether plants need soil to live and grow and support their claims with evidence. Then they present their claims to the class and other students offer feedback.	<ul style="list-style-type: none"> Not all plants need soil to live and grow. Some plants, such as air plants and aquarium plants, don't live in soil at all. Seeds can also sprout and grow in moist paper towels or cotton balls instead of soil.
2 min	Synthesize/summarize today's lesson: The teacher reviews the focus questions that students are trying to answer with soil experiment. Then students summarize their ideas and evidence.	<ul style="list-style-type: none"> The evidence we collected from our soil experiment shows that seeds can grow in moist paper towels. We also looked at different examples of plants that live their entire lives hanging in the air or floating underwater without any soil at all. So not all plants need soil to live and grow.
1 min	Link to next lesson: The teacher announces that in the next lesson, students will examine the evidence they collected from their light experiment and use this evidence to figure out whether plants need light to live and grow.	

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		<p>Engage students in analyzing and interpreting data and observations.</p> <p>Engage students in constructing explanations and arguments.</p>	<p>map with ELL students during the lesson preview.</p> <p>So we already know that plants need air to live and grow. What experiment did the scientist do to find out whether plants need air?</p> <p>What did the experiment show? What evidence did we find?</p> <p>So what did that evidence tell us?</p> <p>Have we found evidence to help us answer any of our other questions about what plants need?</p> <p>NOTE TO TEACHER: <i>Discuss any evidence that students have collected so far from the light, water, and seed experiments.</i></p> <p>Today we'll look at the seeds we planted last time</p>	<p>The scientist gave one plant air and put another plant in a container without any air.</p> <p>The plant without air turned brown and droopy, like it was dying, and the plant with air stayed green and grew taller.</p> <p>That plants need air to live and grow!</p> <p>No. We're still observing our plants and seeds for the other experiments to see what happens.</p>	

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			and see if we can find evidence that will help us decide whether plants need soil to live and grow.		
1 min	<p>Lesson Focus Questions</p> <p>Synopsis: The teacher introduces the focus questions, <i>Do plants need soil to grow and live? What is your evidence?</i></p>	Set the purpose with a <u>focus question</u> or goal statement.	<p>Show slide 3.</p> <p>The focus questions we'll try to answer today are <i>Do plants need soil to live and grow? What is your evidence?</i></p> <p>NOTE TO TEACHER: Write the questions on the board for students to refer to throughout the lesson and draw a box around them. Point to each word as you repeat the questions aloud.</p> <p>To help us answer these questions, we'll look at evidence from our own seed experiment, and we'll learn about some different kinds of plants that scientists have studied.</p>		
6 min	<p>Setup for Activity</p> <p>Synopsis: Working in pairs, students observe the seeds they planted with and without soil and look for evidence to help them answer the question, "Do plants need soil?" Then pairs share their observations with the class, and the teacher records their evidence on a tree map.</p> <p>Main science idea(s):</p>	<p>Make explicit links between science ideas and activities before the activity.</p> <p>Engage students in analyzing and interpreting data and observations.</p>	<p>Show slide 4.</p> <p>Last time, we charted our beginning ideas about whether plants need soil to live and grow. Then we set up our experiment and made some initial observations of the seeds we planted with and without soil and recorded our evidence.</p> <p>Turn and Talk: Now I want you and your partner to observe your seeds again and look for evidence to help you answer our question, "Do plants need soil?" Then talk about your evidence with your partner.</p>		

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	<ul style="list-style-type: none"> We set up our soil experiment to test our idea that plants need soil to live and grow. Many of us think that plants need soil because we see them growing in soil, and we plant seeds in soil. The evidence we've collected so far shows that our seeds without soil are growing just like the seeds with soil. 	<p>Ask questions to elicit student ideas and predictions.</p> <p>Ask questions to probe student ideas and predictions.</p> <p>Ask questions to challenge student ideas and predictions.</p> <p>Engage students in communicating in scientific ways.</p>	<p>ELL support: Give ELL students an opportunity to practice their observation and analysis skills during the lesson preview. This will enable them to participate more fully in the observation-and-analysis portion of the lesson, as well as the discussion that follows.</p> <p>Show slide 5.</p> <p>Whole-class discussion: When you and your partner looked at your seeds, did you find any evidence we can add to our tree map that helps us answer our question, "Do plants need soil?"</p> <p>NOTE TO TEACHER: <i>As students share their observations, add any evidence they cite to the tree map (class evidence chart) you created in the previous lesson.</i></p> <p>Let's have a show of hands. How many of you think that plants <i>do</i> need soil to live and grow? How many of you think that plants <i>do not</i> need soil?</p> <p>Now let's hear your ideas and reasons about whether plants need soil. Remember to use the sentence starters on the slide: "Our idea is ...," "Our evidence is ...," "I agree because ...," or "I</p>	<p>The seeds with soil and the seeds without soil are both growing, so we think that plants don't need soil to live and grow.</p>	<p>Did anyone find evidence that plants <i>do</i> need soil to live and grow?</p>

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			<p>disagree because”</p> <p>NOTE TO TEACHER: <i>During this discussion, add any new ideas and evidence to the tree map you created in the previous lesson.</i></p> <table border="1" data-bbox="884 544 1457 732"> <thead> <tr> <th colspan="2" data-bbox="884 544 1457 626">Do Plants Need Soil? Our Evidence</th> </tr> <tr> <th data-bbox="884 626 1146 662">Plants Need Soil</th> <th data-bbox="1146 626 1457 662">Plants Don't Need Soil</th> </tr> </thead> <tbody> <tr> <td data-bbox="884 662 1146 732"><i>[Student ideas and evidence]</i></td> <td data-bbox="1146 662 1457 732"><i>[Students ideas and evidence]</i></td> </tr> </tbody> </table> <p><i>Don't record ideas without evidence to support them. Examples:</i></p> <ul style="list-style-type: none"> <i>Yes, plants need soil: We always plant seeds in soil. All the plants in our classroom are growing in soil. Trees would fall over if they didn't have roots in the soil.</i> <i>No, plants don't need soil: Plants just need air and water like animals do. Plants need light so they don't die.</i> 	Do Plants Need Soil? Our Evidence		Plants Need Soil	Plants Don't Need Soil	<i>[Student ideas and evidence]</i>	<i>[Students ideas and evidence]</i>	<p>Our idea is that plants need soil.</p> <p>Our evidence is that the plants in the paper towels look like they're going to die soon because they need soil.</p> <p>The plants look a little droopy.</p> <p>We disagree. Both our plants look healthy, so we think that plants don't need soil.</p> <p>Both plants are growing.</p> <p>Their roots are growing down.</p>	<p>What evidence did you find?</p> <p>How do you know the plants need soil? What do they look like?</p> <p>Does anyone agree or disagree?</p> <p>How do you know the plants are healthy? What do they look like?</p>
Do Plants Need Soil? Our Evidence											
Plants Need Soil	Plants Don't Need Soil										
<i>[Student ideas and evidence]</i>	<i>[Students ideas and evidence]</i>										

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			<p>So we have some evidence from our seed experiment that plants <i>don't</i> need soil, but we also have some evidence that plants <i>do</i> need soil.</p> <p>NOTE TO TEACHER: <i>Read the evidence from both columns of the tree map.</i></p> <p>It looks like we need more information before we can answer our question, “Do plants need soil?” To help us figure out which of our ideas is right, let’s explore what some scientists have learned about plants.</p>	<p>A green stem is growing up.</p> <p>There are two leaves on the stem.</p> <p>Both plants are standing up straight.</p>	
15 min	<p>Activity</p> <p>Synopsis: Students study pictures of different plants growing without soil (air plants, aquarium plants, and seeds grown in paper toweling or cotton balls) and learn about each plant. Then they share evidence that the</p>	<p>Make explicit links between science ideas and activity during the activity.</p> <p>Select content representations and models</p>	<p>Next, I’m going to show you some pictures of different plants. Look carefully at each plant and see what you notice about where the plant lives and how it’s growing. I’ll also share what scientists have learned about these plants.</p> <p>As you study the pictures and learn about the plants, see if you can find any evidence to help you figure out whether plants need soil.</p>		

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	<p>teacher adds to their tree map.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Some plants, such as air plants and aquarium plants, can live and grow without any soil at all. Seeds can also sprout and grow in moist paper towels or cotton balls instead of soil. 	<p>matched to the learning goal and engage students in their use.</p> <p>Engage students in analyzing and interpreting data and observations.</p>	<p>ELL support: During the lesson preview, show ELL students the pictures and give them an opportunity to practice sharing observations and evidence so they understand what is expected of them and can participate more fully during the actual lesson.</p> <p>Show slides 6 and 7.</p> <p>NOTE TO TEACHER: <i>When you show students the pictures of the air plants, don't call them air plants yet!</i></p> <p>What do you observe about these plants? What do you see?</p> <p>Now let's find out what scientists have learned about these plants.</p> <p>Look for any new evidence that might help you decide whether plants need soil to live and grow.</p>	<p>Some of the plants don't have roots.</p> <p>They don't have any soil.</p> <p>The plants are living inside a glass ball.</p> <p>Maybe they're fake plants!</p>	

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			<p>Show slides 8–10 (one at a time).</p> <p>NOTE TO TEACHER: <i>Read the information on each slide aloud.</i></p> <p>Show slide 11.</p> <p>What did you learn about these plants? Did you find any evidence about whether they need soil?</p>	<p>The plants don't need soil.</p> <p>My evidence is that the plants can grow without soil.</p> <p>They get water and air through their leaves.</p> <p>They get sunlight, too.</p> <p>They don't need roots.</p> <p>I disagree. The slide said that the</p>	<p>What's your evidence?</p> <p>How do you think these plants can survive without soil?</p> <p>Does anyone agree or disagree? Does anyone want to add on?</p>

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			<p>So scientists call plants like these <i>air plants</i>. Should we add air plants to our tree map as evidence that plants don't need soil?</p> <p>NOTE TO TEACHER: <i>Add air plants to the class tree map as evidence that plants don't need soil to live and grow.</i></p> <p>Show slide 12.</p> <p>Now let's look at another kind of plant. What do you notice about the plants in this aquarium?</p> <p>NOTE TO TEACHER: <i>Direct students to focus on the plants floating at the top of the aquarium. Don't call them elodea plants yet!</i></p> <p>ELL support: Introduce ELL students to the word <i>elodea</i> during the lesson preview. You may also want to have students draw a picture of an elodea plant in their notebooks and write down the definition. Have them add the word and definition to their shared dictionary if they made one. Post the term and definition on a word wall for easy reference.</p> <p>Now let's read what scientists have learned about these plants.</p> <p>As we read what scientists know about these plants,</p>	<p>plants use roots to hang on to the tree.</p> <p>Yes!</p> <p>Some of the plants are growing in soil at the bottom, and some are floating on top of the water.</p> <p>The plants floating in the water don't have roots.</p> <p>Maybe they're plastic plants.</p>	

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			<p>think about whether this information gives you any evidence about whether the plants need soil to live and grow.</p> <p>Show slide 13.</p> <p>NOTE TO TEACHER: <i>Read the information on the slide aloud.</i></p> <p>Show slide 14.</p> <p>What did you learn about these plants? Did you find any evidence about whether they need soil?</p> <p>CONTENT NOTE: <i>Plants can take in carbon dioxide and oxygen dissolved in water, so they don't have to get it from the air.</i></p> <p>So we learned that elodea plants can survive by either rooting themselves in soil or floating freely in a lake or an aquarium. Do you think we should add elodea plants to our tree map of evidence that plants don't need soil to live and grow?</p> <p>NOTE TO TEACHER: <i>Add elodea plants to the class tree map as evidence that plants don't need soil to live and grow.</i></p>	<p>The plants don't need soil. They float on top of the water and get sunlight.</p> <p>I think they can get air because they're floating on the surface of the water.</p> <p>Yes!</p>	

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			<p>Now let's look at some bean seeds and look for evidence to help us decide whether plants need soil.</p> <p>Show slide 15.</p> <p>Turn and Talk: Talk with your partner about the pictures on the slide. What do you notice about the seeds? Do you see any evidence about whether the bean plants need soil to live and grow?</p> <p>Whole-class discussion: Who can tell us what you observed about the bean seeds in the two pictures? What evidence did you find?</p> <p>What about our own seed experiment? Does our evidence match the evidence on the slide?</p>	<p>The bean seeds in the pictures are growing on paper towels or cotton balls.</p> <p>The pictures give us evidence that bean seeds can live and grow without soil.</p> <p>Yes, our seeds are growing without soil too.</p> <p>Our seeds look a lot like the seeds in this picture.</p>	

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			<p>What evidence should I add to our tree map?</p> <p>NOTE TO TEACHER: <i>Add seeds (bean/radish) to the class tree map as evidence that plants don't need soil to live and grow.</i></p>	<p>I wonder if all seeds can grow on paper towels.</p> <p>Seeds can grow and live without soil because the seeds in the pictures and in our experiment are growing on paper towels instead of soil.</p>	
15 min	<p>Follow-Up to Activity</p> <p>Synopsis: Students work in pairs to make claims about whether plants need soil to live and grow and support their claims with evidence. Then they present their claims to the class and other students offer feedback.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Not all plants need soil to live and grow. Some plants, such as air plants and aquarium plants, 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>Show slide 16.</p> <p>So do you think that plants need soil to live and grow? Look at the evidence on our tree map. Let's read it together.</p> <p>Next, you'll work with your partner to write a claim and support your claim with evidence.</p> <p>NOTE TO TEACHER: <i>Have students pair up again. Then distribute handout 3.13 (Do Plants Need Soil to Live and Grow?) to each student. Explain what a claim is and discuss with students how to make a claim and write or draw their evidence.</i></p>		

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	live in soil at all. Seeds can also sprout and grow in moist paper towels or cotton balls instead of soil.	<p>Ask questions to probe student ideas and predictions.</p> <p>Ask questions to challenge student thinking.</p> <p>Engage students in</p>	<p>ELL support: Review this handout with ELL students during the lesson preview and let them practice completing it so they understand what is expected of them and can participate more fully during the actual lesson. Also make sure to introduce the word <i>claim</i>, explain what it means, and provide some examples.</p> <p>Pairs: First, look at the evidence on the tree map again. Then work with your partner to make a claim that answers the question, “Do plants need soil to live and grow?”</p> <p>Write your claim on your handout and then add evidence to support your claims. You can use words or pictures to show your evidence.</p> <p>NOTE TO TEACHER: <i>As students are working, circulate around the room and ask them to explain their evidence. Ask probe and challenge questions, such as “What is your evidence? Why do you think that? How does our experiment support your idea?”</i></p> <p>Show slide 17.</p> <p>Whole-class share-out: Let’s hear the claims and evidence you came up with. When you present your claim to the class, say, “Our claim is ...” and “Our evidence is”</p>		

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		communicating in scientific ways.	<p>As your classmates share their claims and evidence, listen carefully and be ready to agree, disagree, add on, or ask a question. Use sentence starters like “I agree because ...,” “I disagree because ...,” “I want to add on,” or “What do you mean when you say ...?”</p> <p>NOTE TO TEACHER: <i>Review the sentences starters on the Communicating in Scientific Ways poster before the presentations and remind students to refer to the poster as needed during the class discussion.</i></p> <p>ELL support: During the lesson preview, give ELL students an opportunity to practice communicating in scientific ways and using sentence starters so they can participate more fully in this class discussion.</p> <p>NOTE TO TEACHER: <i>Although we want students to conclude that plants don't need soil to live and grow, some students will continue to argue that some plants do need soil. Soil isn't necessary for plants to live and grow, but many plants soak up water from the soil and use soil to anchor themselves so they can stand tall and reach the sunlight. Don't worry if some students still insist that plants need soil. Focus primarily on getting strong evidence.</i></p> <p><i>If students still think that plants get food from soil, you can address this misconception after lesson 5b.</i></p>	<p>Our claim is that that some plants need soil and some don't. Our evidence is that air plants and aquarium plants can live and grow without soil. But land plants need soil.</p> <p>I disagree about land plants because the bean seeds are land plants, and they're growing without soil.</p> <p>Our claim is that not all plants need soil to live and grow. Our evidence is that the plants in the pictures grow in the air and in the water.</p>	<p><i>Questions to ask during the presentations:</i></p> <ul style="list-style-type: none"> • Why do you think so? • What evidence do you have? • Does anyone agree or disagree? • Does anyone have a question? • Does anyone want to add on?

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			<p><i>Soil does support plants, and plants can take in water and minerals stored in the soil, but soil is not energy-providing food for plants.</i></p>	<p>Our claim is that most plants need soil to live and grow, but some don't. Our evidence is that most of the plants we see are growing in soil, but we saw that some plants can grow in air and water, too.</p>	
2 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: The teacher reviews the focus questions that students are trying to answer with their soil experiment. Then students summarize their ideas and evidence.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> The evidence we collected from our soil experiment shows that seeds can grow in moist paper towels. We also looked at different examples of plants that live their entire lives hanging in the air or floating underwater without any 	<p>Engage students in making connections by synthesizing and summarizing key science ideas.</p>	<p>Show slide 18.</p> <p>Our focus questions for today are <i>Do plants need soil to live and grow? What is your evidence?</i></p> <p>Let's summarize our ideas about this.</p> <p>If you think that plants need soil to live and grow, raise your hand. Why do you think so? What is your evidence?</p> <p>NOTE TO TEACHER: <i>Invite one or two students to summarize their ideas and evidence.</i></p>	<p>I think that plants need soil to live and grow because most plants grow in soil.</p> <p>They must need it if they grow in it.</p>	<p>Most plants do grow in soil, but how do you know that plants need the soil to live?</p>

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	soil at all. So not all plants need soil to live and grow.		<p>If you think that plants <i>don't</i> need soil to live and grow, raise your hand. Why do you think so? What is your evidence?</p> <p>So today we learned that some plants can live and grow in air or water without any soil at all. We also found evidence from our seed experiment that plants don't need soil to live and grow. But some of us still think that plants need soil because most plants grow in soil.</p>	<p>I think that plants don't need soil to live and grow. My evidence is that some plants can live and grow without soil.</p> <p>We saw plants that grow in the air, and the seeds in our experiment grew on paper towels.</p>	<p>Can anyone else add some evidence for this claim?</p> <p>Can you give me an example?</p> <p>Does anyone have more evidence to add?</p>
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher</p>	Link science	<p>Show slide 19.</p> <p>In our next lesson, we'll see what's happening with</p>		

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	announces that in the next lesson, students will examine the evidence they collected from their light experiment and use this evidence to figure out whether plants need light to live and grow.	ideas to other science ideas.	<p>the plants we've been growing with and without light, and then we'll look at the evidence we've collected and see if it helps us figure out whether plants need light to live and grow.</p> <p>I wonder what we'll find out!</p>		