Plants and Animals
Lesson 3a: Investigating What Plants Need

Grade: Kindergarten	**Length of lesson:** 40 minutes	**Placement of lesson in unit:** 3a 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 question:** How can experiments help us find out what plants need to live and grow?
Main learning goal: Evidence from a scientific experiment shows that plants need to take in air from their environment to live and grow.		
Science content storyline: In the last lesson, we found out that animals need food, water, and air to live and grow. But do plants have the same or different needs as animals? We can answer this question by testing some of our ideas and predictions about what plants need based on our experiences. After studying an experiment that scientists conducted to find out whether plants need air and comparing our predictions with scientists' observations and evidence, we can conclude that plants need air from their environment to live and grow.		
Ideal student response to the focus question: As scientists, we can set up experiments to investigate what plants need to live and grow. We can't always do the experiments ourselves, but we can read about experiments that scientists have done. In one experiment we read about, scientists found out that plants need air from their environment to live and grow.		

Preparation

Materials Needed

- Science notebooks
- Chart paper and markers

Student Handouts and Teacher Masters

- 3.4 Directions for Starting the Radish or Bean Seeds (Teacher Master) (from lesson 3b)

Ahead of Time

- Two weeks before this lesson, plant the radish or bean seeds (see directions in handout 3.4, Directions for Starting the Radish or Bean Seeds). Make sure you have enough seeds/plants for all three experiments in lessons 3b (light/no light), 3c (water/no water), and 3d (soil/no soil). Water the seeds and keep them in the light. Each pair of students will need two cups of seeds/plants. Alternatively, you could have students work in groups of four.
- Review section 4 in the content background document, focusing on what plants need.
- Create a circle map titled "Our Beginning Ideas: What Do Plants Need to Live and Grow?" Label the center circle "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. Explain the logic involved in designing the science experiment and emphasize that only one need of plants (air) is being tested. Be aware that air may be a hard concept for ELL students to understand because it's invisible. Identify vocabulary terms in the lesson plan to review with students in advance, including *experiment*, *prediction*, and *evidence*. You may want to have students write these terms and their meanings in their science notebooks and add them to a picture dictionary if they're making one. Display these terms and definitions on a word wall for students to refer to throughout the unit.

Lesson 3a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
2 min	**Link to previous lesson:** The teacher reviews key ideas from the previous lesson. Then students discuss how different animals get food, water, and air from their environments to live and grow.	• To live and grow, animals need to get food, water, and air from their environment.
1 min	**Lesson focus question:** The teacher introduces the focus question, *How can experiments help us find out what plants need to live and grow?*	
8 min	**Setup for activity:** The teacher elicits ideas from students about what plants need to live and grow. The teacher challenges students to communicate their ideas and reasoning in scientific ways and records their ideas on a class circle map.	• Scientists communicate in scientific ways by sharing their ideas, supporting their ideas with observations or evidence, and giving reasons for agreeing or disagreeing with each other.
12 min	**Activity:** The teacher reviews what evidence is and then describes an experiment a scientist conducted to find out whether plants need air to live and grow. Students predict what will happen to the plants in the experiment. Then they discuss the results, and the teacher records their observations on a class chart.	• A good experiment enables scientists to collect observable evidence and compare different conditions to help answer a question. • To live and grow, plants need to get air from their environment.
10 min	**Follow-up to activity:** Students analyze evidence from the science experiment and conclude that plants need to get air from their environment to live and grow. Then they use this evidence to help them answer the question, "Do plants need air?"	
6 min	**Synthesize/summarize today's lesson:** The teacher revisits the focus question and then engages students in synthesizing and summarizing key ideas and findings about plants and air from the science experiment.	
1 min	**Link to next lesson:** The teacher announces that in the next lesson, students will conduct their own experiment to find out whether plants need light.	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
2 min	**Link to Previous Lesson** **Synopsis:** The teacher reviews key ideas from the previous lesson. Then students discuss how different animals get food, water, and air from their environments to live and grow. **Main science idea(s):** • To live and grow, animals need to get food, water, and air from their environment.	Link science ideas to other science ideas. Summarize key science ideas. Engage students in using and applying new science ideas in a variety of ways and contexts.	**Show slides 1 and 2.** In our last two lessons, we acted like science detectives and investigated what animals need to live and grow. What did we discover? What three things do animals need to get from their environment to live and grow? Now think about an animal you've seen. It might be an animal in our terrarium, at home, or on the playground. Or it could be an animal you've seen at a park, in the woods, in a lake, in a tree, or in a fish tank. Give me a thumbs-up when you have an animal in mind. **NOTE TO TEACHER:** *Wait until everyone gives you a thumbs-up before asking the following question.* How do you think the animal you have in mind gets the food, water, and air it needs from its environment? Raise your hand as soon as you have an answer. **NOTE TO TEACHER:** *Wait until most students have raised their hands before inviting them to share their ideas.*	Water, food, and air.	

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			Individual think time. **Whole-class share-out:** Who would like to tell us the animal you thought of and how it gets food, water, and air from its environment?	We give our dog food and water in bowls, and she breathes air through her nose. Squirrels eat nuts from trees for food, and I think they drink water with their mouths and breathe air through their noses. We feed the fish in our fish tank with food flakes, and the fish breathes	Good! You told us how your dog gets the food, water, and air it needs from its environment! Who can tell us about a different animal you've seen?

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				through gills. I guess it drinks water through its mouth.	Good job! You told us how a fish gets food, water and air from its environment in the fish tank.
			Who can tell us how one of the animals from our terrarium gets the food, water, and air it needs?	The praying mantis eats ladybugs and drinks water with its mouth, and it gets air through holes on the sides of its body.	So what is the praying mantis's environment? Where does it get all of its food, water, and air?
			And what about you? How do you get food, water, and air from your environment to live and grow?	From the terrarium. *[Students should have plenty to say about this!]*	
		Summarize key science ideas.	So all of these animals—including you!—need to get the same three things from their environment to live and grow. What are these three things again? That's right! All animals need food, water, and air,	Food, water, and air!	

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			but they get these things from their environments in different ways, don't they?		
1 min	**Lesson Focus Question** **Synopsis:** The teacher introduces the focus question, *How can experiments help us find out what plants need to live and grow?*	Link science ideas to other science ideas. Set the purpose with a <u>focus question</u> or goal statement.	**Show slide 3.** So we've talked about what the animals in our terrarium need to get from their environment. But what about the plants in our terrarium? Who remembers the big question we're trying to answer in this unit? Let's read it together: *Do plants and animals need the same things to live and grow? Explain your thinking.* **NOTE TO TEACHER:** *Point to the words on the board as you read the unit central question aloud together.* **Show slide 4.** Today we're going to start a new investigation as science detectives, and we're going to think about a new focus question: *How can experiments help us find out what plants need to live and grow?* **NOTE TO TEACHER:** *Write the focus question on the board for students to refer to throughout the lesson and draw a box around it. Point to each word as you repeat the question.*		

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8 min	**Setup for Activity** **Synopsis:** The teacher elicits ideas from students about what plants need to live and grow. The teacher challenges students to communicate their ideas and reasoning in scientific ways and records their ideas on a class circle map. **Main science idea(s):** • Scientists communicate in scientific ways by sharing their ideas, supporting their ideas with observations or evidence, and giving reasons for agreeing or disagreeing with each other.	Make explicit links between science ideas and activities **before** the activity. Ask questions to elicit student ideas and predictions. Engage students in communicating in scientific ways. Ask questions to probe student ideas and predictions. Ask questions to challenge student thinking. Engage students in constructing explanations	**Show slide 5.** Let's talk about what plants need to live and grow. We said that animals need to get food, water, and air from their environment to live and grow. What do plants need to live and grow? Do they need the same things animals need? Think about this for a moment; then I want to hear your ideas. **Individual think time.** OK. Who would like to share your ideas about what plants need to get from their environment to live and grow? When you share your idea, try to say, "My idea is …" or "I think that …," and the rest of us will be like scientists and think about whether we agree or disagree and why. If you agree or disagree with a classmate's idea, say, "I agree with that because …" or "I disagree with that because …." As you share your ideas, I'll record them on this circle map. **NOTE TO TEACHER:** *Display the circle map you created on chart paper ("Our Beginning Ideas: What Do Plants Need to Live and Grow?")*	• Light or sunlight. • Water. • Soil/dirt. • Air. • Fertilizer or plant	*Probe questions:* • Why do you think plants need *[light, water, etc.]*? • Do you have

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		and arguments.	*and record students ideas during the discussion. Ask probe and challenge questions to clarify student thinking.* **ELL support:** Since students will be using the sentence starters for lessons 3a–d, introduce them to ELL students during the lesson preview and give them an opportunity to practice using them so they'll be able to participate more fully in the lessons. You've come up with a lot of interesting ideas about what plants need to live and grow. Let's talk about why you think plants need these things. Why do you think plants need water? **NOTE TO TEACHER:** *Discuss as many of the ideas on the circle map as time allows. Challenge students to explain why they think plants need a certain thing to live and grow, and ask them to support their reasoning with evidence, if possible.* **ELL support:** During the lesson preview, give ELL students time to practice coming up with ideas of what plants need to live and grow and sharing their reasons and evidence. Create a practice circle map and record student ideas on it during the discussion.	food. • People to take care of them. • A good home. • An environment! Because we have a garden, and we give the plants water so they won't die. I agree, because when my mom forgets to water her plants, they look bad. They look yellow	some observations or evidence to support that idea? Does anyone agree or disagree that plants need water? Can you say some more about what the plants look like when they look bad?

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				and brown, and they lean over. I think water is like food for the plants. Because without water, plants can't grow, just like we can't grow without food. I think plants just need water. They don't need food. I agree, because plants don't have mouths, so they can't eat. I think plants need food, but food for them is water. Because plants have	Who else has an idea about whether plants need water? What makes you think that water could be food for the plants? That's an interesting idea! What do others think? What is your reason?

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				roots that are like their mouths, and they suck in the water. I think plants need plant food because my dad buys plant food at the store to help the plants grow. I think dirt is food for plants. The roots of a plant take in the dirt as food. We always plant seeds in the dirt, so they must need it to live and grow. I don't think plants	Does anyone agree or disagree with that and why? What makes you think that? Does everyone agree that plants need soil as food? What about air? Do you think the plants need air, too?

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				need air. I disagree. I think plants do need air because I heard that plants breathe in what we breathe out. But plants don't have noses, so how can they breathe? Maybe they can breathe through their skin like worms do.	Does everyone agree that plants don't need air? Anyone disagree or want to add on? Does anyone agree or disagree and why?
			Now let's see if you agree or disagree with each idea on our circle map. Remember, these are our *beginning* ideas, so we can expect them to be different, just like scientists		So we have some different ideas about whether plants need air.

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			have different ideas. Give me a thumbs-up if you think that plants need an item on our map and a thumbs-down if you don't. Who thinks that plants need light? Water? Dirt? Air? **NOTE TO TEACHER:** *Have students give a thumbs-up or thumbs-down for every item listed on the circle map and keep a tally of approximately how many students think that plants need each item*. This week, we'll do some science experiments to test our ideas about what plants need to live and grow, and we'll find out which ones are correct.		

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12 min	**Activity** **Synopsis:** The teacher reviews what evidence is and then describes an experiment a scientist conducted to find out whether plants need air to live and grow. Students predict what will happen to the plants in the experiment. Then they discuss the results, and the teacher records their observations on a class chart. **Main science idea(s):** • A good experiment enables scientists to collect observable evidence and compare different conditions to help answer a question. • To live and grow, plants need to get air from their environment.	Make explicit links between science ideas and activities **during** the activity. Highlight key science ideas and focus question throughout. Ask questions to elicit student ideas and predictions.	Today we're going to learn about an experiment that a scientist did to find out what plants need to live and grow. The evidence we collect in all of our experiments this week will help us answer our focus question, *How can experiments help us find out what plants need to live and grow?* **ELL support:** During this discussion, encourage ELL students to refer to their science notebooks and picture dictionary to review the definition of *evidence* that they recorded during the lesson preview. **Show slide 6.** Let's review what *evidence* is. Where have you heard that word before? What do you think of when you hear this word? Look at our Communicating in Scientific Ways	It's like when police find evidence like fingerprints or DNA. It's like clues. So you can prove who did it. Like in the Clue game!	That's a good example of evidence.

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			poster. What symbol reminds us of what evidence is? Why do you think we use a magnifying glass to remind us of what evidence is? So what is evidence? Who can give us a definition? **Show slide 7.** So evidence is a clue that helps us figure out whether something works the way we think it does. Scientists are always trying to find evidence to explain why things happen the way they do. In the next few lessons, we're going to look for evidence that plants need some of the things we wrote on our circle map. Today we're going to investigate whether plants need air. To do this, we'll learn about an experiment that a scientist did. This scientist has special equipment to test ideas about whether	A magnifying glass. Because we can use a magnifying glass to help us find clues or evidence to explain stuff. It's like *NCIS*! Evidence is something you see that helps you decide how to answer a question.	

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			plants need air. We don't have those things in our classroom, so we'll think about what she did and what she found out. **Show slide 8.** First, we'll find out how the scientist set up a good experiment. We'll also learn how to find evidence to answer the scientist's question, "Do plants need air?" To find out the answer to this question, the scientist took two plants of the same kind and size. Both plants looked very healthy. She put both plants in the sunlight and made sure they both had plenty of water. But one plant was left out so it could get air, and the other plant was put in a container where it couldn't get any air. The scientist used a special kind of machine—like a vacuum cleaner—to suck all of the air out of the container. To find out whether plants need air, why do you think it's important to have two plants—one in a place with air and one in a container without any air? **NOTE TO TEACHER:** *The concept of a control in an experiment will likely be very difficult for kindergartners to understand and put into words at this point. As they see how the experiments turn out, they may be able to understand why it's*		
		Ask questions to elicit student ideas and predictions.		It's important so we can see if the plant without any air dies.	Why can't we just have one plant—the one without air?

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			important to compare two plants and answer this question. Do both plants have sunlight in this experiment? Do both plants have water in this experiment? What is the only thing that's different about the two plants? **Show slide 9.** So that's how the scientist set up her experiment. She wanted to compare plants that had air with plants that had no air. Then she made predictions about what might happen to the two plants. A *prediction* is saying what think will happen. What do you predict or think will happen to the two plants? **ELL support:** During the lesson preview, give ELL students time to practice making predictions about what will happen to the two plants. **NOTE TO TEACHER:** *Students might benefit from engaging in a Think-Pair-Share for this prediction activity.*	Because we need to see what the other plant does too, since it has air. Yes, they both have sunlight. Yes, they both have water. One gets air, and one doesn't. The plant in the container will die because it doesn't have any air. The plant in the container will fall	Does anyone have another idea?
		Ask questions to elicit student ideas and predictions. Ask questions to probe student ideas and			

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		predictions. Ask questions to challenge student thinking.		over. It will turn brown. The plant in the container will still have light and water, so it will be fine. It will look healthy. It will stay standing up. It will stay green. If the plant is green and keeps growing, then it's healthy. I think she'll see green leaves on both plants.	What do you think the plant will look like? What will the other plant that has air look like? How will you know it's healthy? How could you tell? What do you think the scientist will see in two weeks?

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<tr><th>Time</th><th>Phase of Lesson and How the Science Content Storyline Develops</th><th>STeLLA Strategy</th><th>Teacher Talk and Questions</th><th>Anticipated Student Responses</th><th>Possible Probe/Challenge Questions</th></tr>
<tr><td></td><td></td><td>Engage students in analyzing and interpreting data and observations.

Engage students in communicating in scientific ways.</td><td>Show slide 10.

Now let’s look at what happened to the two plants two weeks later. Remember that one plant had air, and the other plant didn’t.

As you share what you see, I’ll record your observations on a class chart as our evidence.

NOTE TO TEACHER: Create a two-column chart titled “Do Plants Need Air? Our Evidence” and add the column headings “Plant with Air” and “Plant with No Air.” DO NOT write down inferred ideas, such as “The plant is dying” or “The plant is healthy.” Write down only true observations (the things students can actually see). You may want to spend some extra time discussing the types of observations they’ll make during the investigation (color, how straight the plant is standing, etc.) and have students practice observing these characteristics.

<table><tr><th colspan="2">Do Plants Need Air?
Our Evidence</th></tr><tr><th>Plant with Air</th><th>Plant with No Air</th></tr><tr><td></td><td></td></tr></table>
ELL support: Give ELL students time to practice sharing their observations during the lesson preview. Consider allowing them to engage in a Think-Pair-Share to help them think through their responses.</td><td></td><td></td></tr>
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			Start your sentence, "I see …." Just tell me what you can *actually* see, not things you think are happening but you can't see. Who can tell me one thing you see as you look at what happened to the two plants?	I see that the plant with no air is brown. I see that the plant with air looks healthy. The plant is green, and it's standing up straight.	That's an excellent observation! You told us the color of the plant. Can you see that it's healthy? What do you actually see that tells you evidence the plant is healthy? What evidence do you see? So the color of the plant with air is still the same as when the experiment started, right?

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			Now let's look at the observations or evidence I wrote down on our chart. **NOTE TO TEACHER:** *Read the evidence on the chart, starting with students' observations about the plant with air.*	I see that the plant with no air is dying. It's all shriveled up. The leaves are drooping. The leaves are brown.	What do you see when you look at the plant with no air? Can you actually see that it's dying? What evidence do you see that it's dying?
10 min	**Follow-Up to Activity** **Synopsis:** Students analyze evidence from the science experiment and	Make explicit links between science ideas and activities **after** the	What did we learn from today's experiment that can help us answer the scientist's question, "Do plants need air?" Look at the evidence on our chart and think for a		

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	conclude that plants need to get air from their environment to live and grow. Then they use this evidence to help them answer the question, "Do plants need air?" **Main science idea(s):** • A good experiment enables scientists to collect observable evidence and compare different conditions to help answer a question. • To live and grow, plants need to get air from their environment.	activity. Engage students in analyzing and interpreting data and observations. Engage students in constructing explanations and arguments. Engage students in communicating in scientific ways.	moment about what it tells us. Does the evidence tell us that plants need air, or does it tell us that plants don't need air? **Individual think time.** **Show slide 11.** **Whole-class share-out:** So based on our evidence, do you think that plants need air? When you share your ideas, use one of the sentence starters on the slide: *I think plants need air. My evidence is _____.* Or *I think plants don't need air. My evidence is _____.* Make sure to tell us how the observations we recorded on our evidence chart support your answers. **NOTE TO TEACHER:** *Give students 30 seconds of think time before asking them to share their answers. You may also want to have students engage in a Think-Pair-Share before sharing their ideas with the class.* **ELL support:** During the lesson preview, give ELL students time to practice answering this question and supporting their ideas with evidence.	I think plants need air. My evidence is that the plant with no air died.	What evidence do you see that makes you think that? How do you know the plant died? What do you see that

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			Consider having students engage in a Think-Pair-Share to help them think through their responses.	It has brown leaves. I think plants need air. My evidence is that the plant with no air turned brown but the one with air stayed green. One plant had air, and the other plant didn't. Yes. Yes. Air made the difference. The plant	makes you think it died? Does anyone else have ideas about whether plants need air? So what was the only thing that was different about the two plants? Did they both have water? Did they both have light? So what made the difference in whether the plants lived and stayed green?

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			Let's have a show of hands. How many of you agree that the experiment shows that plants need air? How many disagree? **NOTE TO TEACHER:** *If any students disagree, ask probe questions to find out why.* **Show slide 12.** I'm going to write our conclusion at the bottom of our chart, and I want you to help me complete the sentence: *We think plants need air to live and grow because _____.* **NOTE TO TEACHER:** *Have students help you complete the statement. For example, you might finish it by saying,"… because the experiment showed that the plant with air stayed green, and the plant without air turned brown and wilted.*	without air turned brown, and the leaves are hanging down. But the plant with air stood up tall and stayed green.	
6 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** The teacher	Highlight key science ideas	**Show slide 13.** Our focus question for today is *How can experiments help us find out what plants need to*		

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	revisits the focus question and then engages students in synthesizing and summarizing key ideas and findings about plants and air from the science experiment. **Main science idea(s):** • A good experiment enables scientists to collect observable evidence and compare different conditions to help answer a question. • To live and grow, plants need to get air from their environment.	and focus question throughout. Engage students in making connections by synthesizing and summarizing key science ideas. Summarize key science ideas. Engage students in communicating in scientific ways.	*live and grow?* How do you think today's experiment helped us find out what plants need to live and grow? So today we learned about an experiment a scientist conducted to answer the question, "Do plants need air?" We made predictions about what the experiment would show, and then we observed the results and used our observations as evidence to answer the question. What did we decide? Think about the predictions you made earlier. Did your predictions about the plants match what actually happened in the experiment? **Show slide 14.** Now let's summarize what we learned today. How did we act like scientists today? What did we do that scientists do when they're trying to figure out how something works? **NOTE TO TEACHER:** *If students get stuck, encourage them to look at the symbols on the Communicating in Scientific Ways poster*.	That plants need air to live and grow. We answered a question about what plants need. We studied an experiment.	

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			What question was the scientist trying to answer? What experiment did the scientist design to help her answer this question? And what did the results of the experiment show the scientist and us?	We made predictions. We made observations. We looked for evidence. We talked about our ideas. We agreed or disagreed and told each other why. Do plants need air? She put one plant in a container where it couldn't get any air. The experiment showed that plants need air. Our evidence is that the plant without air died, but the plant with air stayed	And what is our evidence?

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				green.	
1 min	**Link to Next Lesson** **Synopsis:** The teacher announces that in the next lesson, students will conduct their own experiment to find out whether plants need light.	Link science ideas to other science ideas.	**Show slide 15.** So we know from today's experiment that plants need air to live and grow just like animals do. Do you think that plants need light to live and grow? Next time, we'll set up our own experiment to help us answer this question.		