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### Lesson 3: The Importance of Air and Water to the Sagebrush

#### Unit: 5<sup>th</sup> Grade Ecology Unit: A Sagebrush Expedition Lesson: The Importance of Air and Water to the Sage

**Overview:** The objective of this lesson is to explore some of the abiotic factors that influence the sagebrush landscape. Students will review what they learned from the landscape equation through a fun game of Simon Says. They will think about why plants rely chiefly on air and water to create their own food in order to grow. The emphasis will be on the idea that plant matter comes mostly from air and water not from soil. Through inquiry, students will design a mini research investigation that explores deeper into the relationship between these abiotic factors and plants which allows students the opportunity to witness how matter can be transported into, out of and within a system.

**Main Take Away:** Students will learn that plants do not produce the food they need to grow from the soil. Instead plants get what they need to grow chiefly from air and water.

#### Learner Outcomes

*Students will be able to...*

- Explain why air and water are considered abiotic factors in the sagebrush landscape.
- Understand how and why plants acquire their material for growth chiefly from air and water.
- Engage in scientific investigations that give them the opportunity to support an argument with evidence, data, and/or a model.

#### Getting Ready

**Materials:** pictures for abiotic Simon Says game, sagebrush list, probe worksheets, materials for mini SCI (mini scientific investigation); (bean seeds, plastic zip lock bags, water, paper towels, soil, cups for planting with soil, salt, sugar, ruler, magnifying glass, etc.), naturalist journals, pencils, example table.

**Preparation:** Gather abiotic pictures and/or objects from previous lesson for the Simon Says game. Gather all possible materials for mini SCI. Collect more materials than you think you might need in order to give students the opportunity to choose how they want to manipulate a variable in growing their bean seed.

**Location:** Outside for Abiotic Simon Says. Classroom for remainder of the lesson.

#### Length of Time:

2-3 Lessons

Approximately 60-75 minutes each

**NGSS Standard(s) Addressed:** 5th grade Life Science 1: From Molecules to organisms: Structures and Processes

- **Performance Expectations: 5-LS1-1:** Students who demonstrate understanding can: **support an argument** that plants get the materials they need for growth chiefly from air and water.

#### Place-Based Principle(s) Addressed:

- Learning takes place in the school yard, local community, and local environment.
- Engaging students in investigation, inquiry, and problem solving.
- Using local experts

<p>(emphasis on the idea that plant matter comes mostly from air and water not from soil)</p> <ul style="list-style-type: none"> <li>• <b>Disciplinary Core Ideas: LS1. C:</b> Organization for Matter and Energy Flow in Organisms: plants acquire their material for growth chiefly from air and water.</li> <li>• <b>Cross Cutting Concepts: 5-LS1-1:</b> Energy and Matter: Matter is transported into, out of and within systems.</li> <li>• <b>Science and Engineering Practices: 5-LS1-1:</b> Engaging in argument from evidence: <b>support an argument with evidence, data, or a model.</b></li> <li>• <b>Connections to Nature of Science: 5-LS2-1:</b> Scientific knowledge is based on empirical evidence</li> </ul>	
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**Unit Connections**  
(How specific lesson connects to overall goals and objectives of the unit)

- Transfer Goals for Lesson: *Students will be able to independently use their learning to understand that...***
- TG1- Science is a process that helps us gain a collective understanding of how the world works, it is a lifelong process, it is applicable every day, and accessible to everyone.
  - TG2- Humans are an interconnected part of the natural world and can have both positive and negative impacts.
  - TG3- Cultivating a sense of place, through intentional interactions, inspires curiosity about one’s community and helps to develop a conservation ethic.

**Unit Essential Question: *Students will keep considering...***  
**What is special about my community and what can I learn from it?**

- Specific Lesson Content Objectives: *students will be able to...***
- Explain why air and water are considered abiotic factors in the sagebrush landscape.
  - Understand how and why plants acquire their material for growth chiefly from air and water.
  - Engage in scientific investigations that give them the opportunity to support an argument with evidence, data, and/or a model.

<p><b>Specific Lesson Language Objectives: <i>Students will be able to...</i></b></p> <ul style="list-style-type: none"> <li>• Define and provide examples of the terms observation, question, hypothesis, data, results, and conclusion in the context of the steps of the science circle.</li> <li>• Orally engage in a scientific argument by pointing, speaking, or a combination of both.</li> </ul>	<p><b>Key Vocabulary Words:</b></p> <ul style="list-style-type: none"> <li>• Water</li> <li>• Air</li> <li>• Photosynthesis</li> <li>• Observation, question, hypothesis, data, results, conclusion</li> <li>• Food vs. Nutrients</li> </ul>
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**Background Information for the teacher:**  
 Students will be introduced to the science circle which helps to explain the scientific process of investigation. Through the investigations and exploration of how plants use water and air chiefly to grow, students will gain knowledge and awareness of these abiotic components that are specific to the sagebrush ecosystem. This will give them a deeper understanding of this piece of the landscape equation and how these abiotic factors affect the flora and fauna of the sagebrush landscape.

**The Science Circle:**

A tool used by educators to help explain the process of scientific investigations. It breaks down the process of research into various steps. These steps used by researchers when performing research. The steps include the following:

1. **Making Observations:** Students are encouraged to look at the world around them and asked to begin noticing things around them based on the use of their senses. It is important to encourage the use of all of our senses; especially since we do not commonly use taste. We talk about how, as humans, we tend to rely heavily on our sense of sight, but in fact we have many other senses that when used allow us the opportunity to connect with the world around us at a much deeper level. Discuss what senses other animals use or rely on more heavily. Examples: coyote uses sense of smell, owls use sight but specifically night vision, raccoons use their sense of touch, and rabbits use their sense of hearing.
2. **Asking Questions:** After observations have been made begin to ask questions. Why does a coyote rely heavily on their sense of smell, how can sage survive with very little water available, why do pronghorn migrate so far in the winter time? The idea is to get students to ask questions and hone in on their curiosity about the environment around them.
3. **Making a Hypothesis:** Hypotheses are a supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation that drive research. A person observes something in the environment around them which sparks their curiosity and causes them to ask a question. That person then predicts the answer to the questions based on prior knowledge and evidence surrounding them. However, in order to prove or disprove this prediction or hypothesis that person must investigate. For example, a student observes a Western Meadowlark bird while out in the sage and questions why some are extremely yellow and some appear to be just brown. That student then creates a hypothesis; the birds who are really yellow are trying to get the attention of other birds. The question is, "How can I figure out whether or not I am correct?"
4. **Design a Study:** One then decides determines the process to prove or disprove their hypotheses. One might go out in the field to look at more birds, look in books, journals or on the internet; or possibly use another scientific method which assists in the collection of data needed for the research project.
5. **Collect Data:** Go get our hands dirty. Students need to collect data or information based on the question. For the example given above, going out in the field to observe the behavior of these birds further would be a useful endeavor. Students can research books, journals, or the internet to find out more information about the behavior of this bird species.
6. **Analyze Data:** When the data has been collected, it needs to make sense. Using tables, graphs, or other statistical methods would be beneficial. What does the data tell us? What are our results?
7. **Conclusion:** Finally, drawing conclusions based on the collected data will help to answer the question and determine whether or not our hypothesis was supported. We discovered that male birds are usually trying to attract females for mating during the spring months and become extremely bright and vocal. When students go out in the field and witness this behavior happening with the Western Meadowlark, it now can be concluded that the birds who are bright yellow are males and they are trying to get the attention of the females.
8. **Share:** This can arguably be the most important part of the science circle. What is the point of performing investigations and doing research if the information is not shared? The information that we currently have about various ecosystems has come from others research. (Teton Science Schools, 2016)

By understanding the steps in the science circle, students can understand how to perform scientific investigations based on their curiosity about the world around them. The overall objective is for students to make observations, ask questions based on their curiosity and help them understand that anyone can do science and anyone can be a scientist anywhere.

### **Photosynthesis:**

The process used by plants and other organisms to convert light energy, normally from the Sun, into chemical energy that can be later released to fuel the organisms' activities or energy transformation. During oxygenic

photosynthesis, light energy transfers electrons from water (H<sub>2</sub>O) to carbon dioxide (CO<sub>2</sub>), which produces carbohydrates or sugars, which are the food for the plant. In this transfer, the CO<sub>2</sub> is “reduced” as it receives electrons, and the water becomes “oxidized”, as it loses electrons. Ultimately plants are sequestering CO<sub>2</sub> from the atmosphere and giving off the left over O<sub>2</sub> after they have made food for them to grow. The CO<sub>2</sub> is coming from the atmosphere and the H<sub>2</sub>O is providing the electrons for photosynthesis to occur.

### **Food vs. Nutrients plants need:**

Plants need nutrients to survive and grow such as phosphorus, nitrogen, potassium, sulphur, calcium, oxygen and magnesium. Many of these other nutrients can be found in soil. These nutrients are not necessary for the plant to create food, but are vital for the mature growth of the plant. It is important to recognize that soils do not need soil to grow food, but soil often contains many of the other nutrients that the plant needs. If the nutrients are provided, the plant does not need soil in order to survive. This can be seen through hydroponics. The word hydroponic comes from the Latin word meaning working water. Simply put, it is the art of growing plants without soil. The plants are able to get the nutrients they need for photosynthesis from the air and sunlight. The remaining nutrients are available to the plants through the water.

*See Life Science Assessment probes 13 “Needs to Seeds” and 15 “Is it Food for Plants” for more information regarding where plants and seeds get their nutrients in order to make their own food to survive and grow.*

### **Building Background for Students: (ELL principle)**

#### **Activate Prior Experiences:**

The teacher will hand out the “Is it Food for Plants” probe worksheet that will ask students to pick from a variety of options what might be food for a plant. This exercise will help access students’ prior knowledge on how plants grow and what they use for food. Students will work individually to mark which things they think is food for plants.

The teacher will ask students to:

1. Turn to a peer sitting next to them to discuss what they chose.
2. Explain why they chose these things as food for plants.
3. Share their thoughts with the rest of the class and write these choices on the board for all students to see.

#### **Link to New Learning from Prior Learning:**

The students will be introduced to the scientific process through a visual representation called the science circle. They will be introduced to the eight steps of the science circle in order to prepare them for the mini scientific investigation they will afterwards perform.

The teacher, working together with students, will introduce each step and ask students to:

1. Think about the meaning of these words: observation, question, hypothesis, collecting data, results, conclusion, and share.
2. Create kinesthetic movements for each step in order to help students remember each steps and its meaning.

For example, students might pretend to look through binoculars to demonstrate the observation step of the science circle.

#### **Vocabulary:**

1. New content vocabulary, observation, question, hypothesis, data, results, conclusion, nutrients, photosynthesis, will be added to the word wall.

The students will participate in the fly swatter game. The class will be divided into two groups and the teacher will do the following:

1. Write the vocabulary words on the board.
2. Call out a statement or perform a kinesthetic movement  
Students will have to announce the correct word before the other team.

An example is “what is the process called that helps plants make their own food?”

Students would need to call out the word “photosynthesis”.

Another example might be that the teacher pretends to look through binoculars and students need to hit the word “observation”.

**Common Student Misconceptions/Student Challenges:**

- Plants require the material and nutrients they need to grow through the soil.
- The difference between food and nutrients
- Concept that animals get their food and nutrients from the environment around them where plants get their nutrients from the environment around them to create their own food.
- All plants need light
  - This is true for part of their life cycle, but a plant embryo, a sprout, and an emerging seedling do not need light at those stages in the life cycle because they have stored energy and therefore do not need to make food. Once it has used up all the food that was stored in the seed’s cotyledon, the seedling needs light to make its own food, using its true leaves.

**Materials:**

- Pictures for abiotic Simon Says (if cannot play outside)
- Sagebrush list from previous lesson
- Materials for mini SCI (bean seeds, soil, plastic zip lock bags, paper towels, water, sugar, salt, cups for planting with soil, ruler, magnifying glass, etc.)
- Naturalist journals and pencils

**Set-up:**

- Gather abiotic pictures and/or objects from previous lesson for Simon Says game.
- Gather all possible materials for mini SCI.
- Collect more materials than you think you might need in order to give students the opportunity to choose how they want to manipulate a variable in growing their bean seed.

Lesson Agenda	Suggested Procedure	ELL Rationale
<p><b>Review:</b> Approximately 15min</p> <p><b>Engage:</b> Approximately 20min</p> <p><b>Abiotic Simon says game will get students thinking about Abiotic factors in the landscape</b></p> <p><b>Discussion of abiotic factors specific to the sagebrush landscape</b></p>	<p>Class will begin by assessing students about what they learned the previous lesson.</p> <p><b>Abiotic Simon Says:</b> Approximately 5min</p> <ul style="list-style-type: none"> <li>• Review with students the components of the landscape equation that they learned previously. (Abiotic= nonliving, Biotic= living, Culture= human influences) Explain to class that the focus for today’s lesson will be on some of the abiotic components found in the sagebrush landscape.</li> <li>• Students will be asked to perform the action called out by the instructor only if the action involves something abiotic. <b>(F1)</b> For example, if the instructor calls out “Simon Says...pick up soil,” the student must pick up soil or a picture of soil. If the instructor calls out “Simon Says...touch a tree, “any student who moves towards a tree or picture of a tree is out for that round, because the tree is not abiotic; it is biotic.</li> <li>• Repeat the step above using various <i>living, non-living, and human (cultural)</i> related objects until you feel that students are able to demonstrate their understanding between <i>these three factors</i>.           <ul style="list-style-type: none"> <li>○ Possible Abiotic Simon Says Call Outs:               <ul style="list-style-type: none"> <li>▪ Pick up soil (abiotic)</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Reviewing and using repeating both information and vocabulary increases comprehensibility.</li> <li>• Interactive game will reinforce new vocabulary, increase interaction, and increase comprehensibility by connecting to prior knowledge.</li> <li>• Circling abiotic factors on sagebrush list will increase higher order thinking through application.</li> <li>• Prior knowledge will be activated</li> </ul>

	<ul style="list-style-type: none"> <li>▪ <i>Find a rock (abiotic)</i></li> <li>▪ <i>Point to a piece of scat (biotic)</i></li> <li>▪ <i>Point to the sun (abiotic)</i></li> <li>▪ <i>Breathe in the air (abiotic)</i></li> <li>▪ <i>Hug a tree (biotic)</i></li> <li>▪ <i>Pat a friend’s back (biotic)</i></li> <li>▪ <i>Flap your arm’s like a bird (biotic)</i></li> <li>▪ <i>Touch something human made (culture)</i></li> <li>▪ <i>Hike down a human made path (culture)</i></li> </ul> <p><b>Introduction to Abiotic Factors in the Sage:</b> Approximately 5min</p> <ul style="list-style-type: none"> <li>• Pose the following question: “Looking at our list from the previous lesson, which objects would be considered abiotic? Please explain why.” <ul style="list-style-type: none"> <li>○ <i>Potential Student response:</i> <ul style="list-style-type: none"> <li>▪ <i>These things are non-living</i></li> </ul> </li> <li>○ Ask students to volunteer to circle an abiotic factor in a different color marker. <b>(F2)</b></li> <li>○ After each student circles have student ask peers whether they agree or disagree with this decision and explain their answer.</li> </ul> </li> <li>• Introduce that they are going to focus on the abiotic factors of water and air:</li> <li>• Ask students to think of how some of the biotic factors are interconnected to the abiotic factors of air and water with an elbow buddy. Share out to the whole class. <ul style="list-style-type: none"> <li>○ <i>Potential Student responses:</i> <ul style="list-style-type: none"> <li>▪ <i>Plants need water to grow</i></li> <li>▪ <i>Plants make their food through photosynthesis</i></li> <li>▪ <i>Plants make their food using the light from the sun</i></li> <li>▪ <i>Animals need water to drink</i></li> </ul> </li> <li>○ The lesson focus should be the student responses about plants needing water or air to survive.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Use of elbow buddies will increase interaction.</li> </ul>
<p><b>Explore:</b> Approximately 30min</p> <p><b>Is it food for plants probe will get students thinking about what plants need to grow.</b></p> <p><b>Needs of seeds is an extension</b></p>	<p><b>Is it Food for Plants Probe:</b> Approximately 15min</p> <ul style="list-style-type: none"> <li>• Hand out “Is it Food for Plants” probe worksheet.</li> <li>• Have one student read the instructions.</li> <li>• Give students a few minutes to put an X next to things they think plants use as food. Make sure students explain their thinking by 2-3 bulleted responses and at least one complete sentence.</li> <li>• Have students share what they thought with an elbow buddy.</li> <li>• Discuss results with the class as a whole.</li> <li>• <b>Purpose of probe:</b> <ul style="list-style-type: none"> <li>○ The purpose of this assessment probe is to elicit students’ ideas about food and plants. The probe</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Elbow buddies will increase interaction.</li> <li>• Probes will access students’ prior knowledge about what plants need to grow.</li> <li>• Discussing differences between food and nutrients will increase higher</li> </ul>

**probe. Can be used instead of the first probe or as an addition**

Approximately 30min

is designed to reveal whether students use a biological concept of food to identify what plants use for food.

- *See attached probe for further explanation*
- Pose the following question:
  - “What is food and what is a nutrient?” **(D1)**
  - Have them discuss this in small groups.
- Write the words food and nutrient on the board and ask students to come up and write some of their thoughts around these words.
  - *Potential Student response:*
    - *Food is what I ate for breakfast*
    - *Nutrients are in my vitamins*
    - *Food is something you cook*
    - *Nutrients are what plants need to grow*
- Discuss these responses and help students understand the differences between the word **food** and the word **nutrient**.
  - Emphasize that animals, including humans, must find their food versus plants use nutrients to create their own food in the form of sugar.
- Show a container of plant food and a container of human vitamins. Explain the analogy between the two to show that their purpose is to provide essential inorganic nutrients, not food energy.
  - Pose following question: “Can humans survive on only these vitamins?” Why or why not?
  - Have students think and pair, share (think individually, pair up to discuss, and share with whole group)

**Needs of Seeds Probe:** Approximately 15min

- Pose the following question: “Now that we have learned a little more about what nutrients plants need in order to create their own food, let’s think about what a seed would need in order to germinate or sprout.”
- Hand out “Needs of Seeds” probe worksheet.
  - *This probe can also be used as a card sort. Write the words on cards and have students sort them into piles of things seeds need to sprout and things seeds do not need to sprout. Listen carefully as they discuss their ideas about which pile to put their cards in.*
  - *Have a picture of a sprout or a real sprout for students who may not know this word or what a sprout is. (F3)*
- Have one student read the instructions.

order thinking with comprehension.

- Think-pair-share will increase interaction.
- Having students read instructions out loud increases interaction.
- Lower level ELLs can follow reading with their finger. This can be done with a partner.

	<ul style="list-style-type: none"> <li>• Give student a few minutes to put an X next to things they think plants use as food. Make sure students explain their thinking by 2-3 bulleted responses and at least one complete sentence.</li> <li>• Have students share their thoughts with an elbow buddy.</li> <li>• Discuss results with the class.</li> <li>• <b>Purpose of probe:</b> <ul style="list-style-type: none"> <li>○ The purpose of this assessment probe is to elicit student’s ideas about seeds. It specifically examines whether or not students recognize that a seed has needs similar to other organisms that allow it to develop into the next stage of its life cycle.</li> <li>○ <i>See attached probe for further explanation</i></li> </ul> </li> <li>• Explain to students that they are going to engage in a mini science investigation where they will be given the opportunity to make predictions and test their ideas with seeds that germinate easily, such as bean seeds.</li> </ul>	
<p><b>Explore:</b> Approximately 30min</p> <p><b>Introduction to the Science Circle: a model for the scientific process</b></p>	<p><b>Introduce the Science Circle:</b> Approximately 15min</p> <ul style="list-style-type: none"> <li>• Bring out science circle poster which includes the eight steps. (see background information for each step’s description)</li> <li>• Explain that the Science Circle is a model to help represent the scientific process used by researchers and scientists.</li> <li>• Number students from 1-8. Each number group will represent one of the steps of the science circle.</li> <li>• Objective of each group: Responses should be written or drawn in naturalist journal (<b>D2</b>) <ul style="list-style-type: none"> <li>○ Discuss what the word means</li> <li>○ Why is this included in the scientific process?</li> <li>○ How does this stage help with a person’s research or investigation?</li> <li>○ What other steps might your step be connected to? Give evidence and reason to back this claim.</li> </ul> </li> <li>• Have each group share. Encourage creativity in the presentation. For example, students could orally present as well as act out their step. (One student could talk about observation, while other students in group are acting out what that might look like). <ul style="list-style-type: none"> <li>○ It is important to emphasize that all students in each group need to be a part of the presentation.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Small group work will increase interaction.</li> <li>• Students will explain what they think the steps of the science circle mean. This will activate prior knowledge, introduce new vocabulary, and increase higher order thinking through explanation.</li> <li>• Students will create kinesthetic movements for each step of the science circle model which will increase comprehensibility and interaction.</li> </ul>
<p><b>Elaborate:</b> Approximately 45-60min</p>	<p><b>Mini Science Investigation: (Mini SCI) (S2)</b> Approximately 20min (<b>S1</b>)</p> <p>Investigations that involve germinating seeds under various conditions help students recognize that some factors are needed for germination and others are not. Students can eventually</p>	<ul style="list-style-type: none"> <li>• This hands-on, inquiry based experiential investigation will</li> </ul>



distinguish between the needs of seeds and the needs of the growing plant.

- Announce the following to students: “Now that we have a better understanding that plants need nutrients from both air and water in order to create their own food, you are going to have the opportunity to get involved in an inquiry-based mini science investigation using steps from the science circle.
- Have students work in pairs for this investigation.
- Explain that they will be making predictions and will test their ideas using seeds that are easy to germinate or sprout.
- Once students are in pairs pass out the bean seeds and magnifying lenses for students to make initial observations.
  - Students need to draw their bean seed in their naturalist journal and write 2-3 descriptions about the bean seed.
  - Help students see where water is taken in, gases are exchanged, and food is stored for the young embryo. This will help students understand how the seed contributes to the growth and life functions of the young plant.
- Have students think about a question they would like to ask that involves germinating their seeds under various conditions. This will help students recognize that which factors are needed or not for germination.
  - *Potential questions:*
    - *Does a bean seed need soil to grow?*
    - *Will a bean seed grow better in the light or in the dark?*
    - *Will a bean seed sprout earlier outside or inside the classroom?*
- Once students have a question they need to create a hypothesis about what they think will happen to the bean seed.
  - *Potential hypotheses:*
    - *A bean seed need soil in order to grow.*
    - *A bean seed will sprout faster if grown in the light.*
    - *A bean seed will sprout earlier inside the classroom because it is cold outside.*
- Now students need to set up their investigation. Have various tools and materials out on a table so students can choose what they need to perform their investigation based on their question and hypothesis. *Students may need guidance with this process. Emphasize that they*

increase interaction and comprehensibility.

- Working in pairs will increase interaction. ELLs can be placed with higher level ELLs or native English speakers.
- Lower level ELLs can draw each step of the investigation and label drawings with one word if able.
- Modeling will be important for this investigation and will increase comprehensibility.
- Higher order thinking will be increased through the investigation. Students will need to explain, construct, compare and contrast, and conclude.
- Students will also need to argue why plants chiefly use air and water to grow using evidence which increase higher order thinking.
- Lower level ELLs can demonstrate their knowledge through drawings, pointing, and basic written conclusions.

	<p>are only changing <u>one</u> variable or factor (soil, temperature, light, etc.)</p> <ul style="list-style-type: none"> <li>○ Potential investigations: <ul style="list-style-type: none"> <li>▪ Students will plant one bean seed in soil and one bean seed in a bag with wet paper towel and place them in the same spot.</li> <li>▪ Put two bean seeds in wet paper towels in two separate plastic bags.</li> <li>▪ Place one bag in a dark closet and one bag near the window where natural sunlight filters through.</li> <li>▪ Put two bean seeds in wet paper towels in two separate plastic bags and place one bag in the classroom near the window and one bag outside.</li> </ul> </li> <li>• Emphasis for this investigation is on students beginning to use the science circle and recognizing which step they are using, changing one variable to see more clearly how plants get the nutrients they need to create their own food, and inquiry.</li> <li>• Students are given the opportunity to create their own investigation with guidance.</li> <li>• See attached probe 5 “Seeds in a Bag” for another investigation idea looking at whether or not seeds can grow if they are in a sealed bag (modeling a closed system).</li> <li>• This will be an ongoing investigation. Students will need to check on their beans each day and record measurement of growth in their naturalist journal. <i>They will be graded on initial observations and data table at the end of the unit.</i> <ul style="list-style-type: none"> <li>○ Display example table (attached below) for students. This will help them know how to set it up in their journals. They may need additional guidance in setting the table appropriately for their investigation.</li> </ul> </li> </ul>	
<p><b>Evaluations and Assessment Check ins:</b></p> <p>D: Diagnostic assessment  F: Formative assessment  S: Summative assessment</p>	<p><b>Evaluations and Assessment Check ins:</b></p> <p><b>(F1):</b> Creative way to explore what students have learned and understand about the abiotic, biotic, and cultural components of the landscape equation through a fun game.</p> <p><b>(F2):</b> Agree and disagree statements provide students the opportunity to practice metacognition by thinking about their own understanding of what an abiotic object is and then applying this knowledge to the sagebrush ecosystem.</p> <p><b>(D1):</b> Addresses students’ prior knowledge of what food is and what nutrients are in order to understand their conceptions or misconceptions about how they are different and how plants and animals rely on them differently.</p>	<ul style="list-style-type: none"> <li>• These assessments will activate prior knowledge, link prior knowledge of abiotic components to new learnings about how plants rely on these abiotic components, and increase higher order thinking through using the</li> </ul>

	<p><b>(F3):</b> Card sort assessment of what seeds need to germinate provide an opportunity for students to access their prior knowledge. Additionally, the cards promote metacognition by surfacing uncertainties in their thinking about what seeds really need to grow.</p> <p><b>(D2):</b> Identifies students' prior knowledge about the scientific process by breaking it into steps. It also displays challenges that exist for students in using this model.</p> <p><b>(S1):</b> Students will be graded on how well they were able to follow the steps of the science circle. Students will be graded on their observation drawing, question, hypothesis, data recorded as plant germinated and grew, and the conclusion they were able draw based on results of their data.</p>	<p>science circle as a model for the scientific process which they will demonstrate by engaging in a mini scientific investigation.</p>
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**References:**

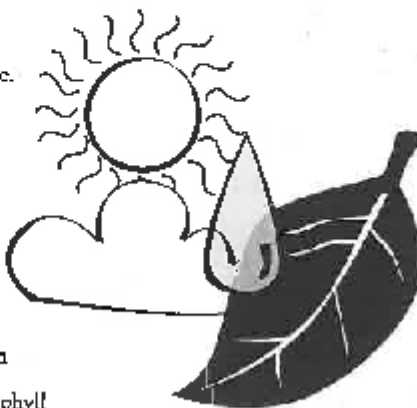
- Life Science Assessment Probes 13, 14 and 15.
- TSS Science Circle

Uncovering Student Ideas in Primary Science

## Is It Food for Plants?

Organisms, including plants, need food to survive. Put an X next to the things you think plants use as food.

- |   |                                      |
|---|--------------------------------------|
| <input type="checkbox"/> sunlight                       | <input type="checkbox"/> soil        |
| <input type="checkbox"/> plant food from a garden store | <input type="checkbox"/> water       |
| <input type="checkbox"/> sugar                          | <input type="checkbox"/> leaves      |
| <input type="checkbox"/> carbon dioxide                 | <input type="checkbox"/> oxygen      |
| <input type="checkbox"/> minerals                       | <input type="checkbox"/> chlorophyll |
| <input type="checkbox"/> fertilizer                     | <input type="checkbox"/> vitamins    |



Explain your thinking. How did you decide if something on the list is food for plants?

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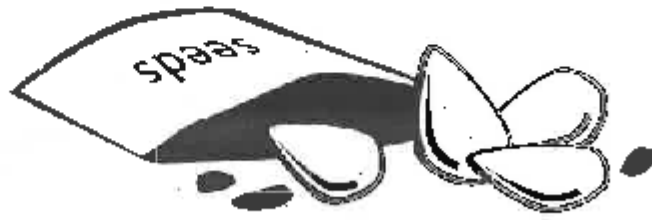
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## Needs of Seeds

Seeds sprout and eventually grow into young plants called seedlings. Put an X next to the things you think a seed needs in order for it to sprout.

- water
- soil
- air
- food
- sunlight
- darkness
- warmth
- Earth's gravity
- fertilizer



Explain your thinking. Describe the "rule" or reasoning you used to decide what a seed needs in order to sprout.

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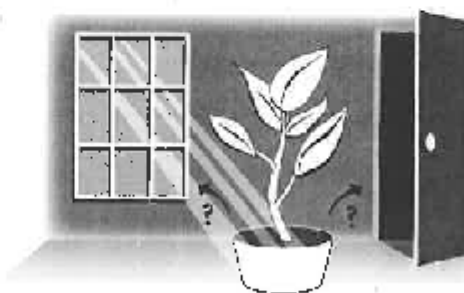
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## Plants in the Dark and Light

Four friends wondered how light affected the growth of plants. They decided to test their ideas using young bean plants. One set of plants was put in a dark closet for eight days. The other set of plants was put on a shelf near a sunny window for eight days. The friends then measured the height of the plants after eight days. This is what they predicted:



Carl: "I think the plants in the dark closet will be the tallest."

Monique: "I think the plants by the sunny window will be the tallest."

Jasmine: "I think the plants will be about the same height."

Drew: "I think the plants in the closet will stop growing and die."

Which friend do you agree with and why? Explain your thinking.

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