

Lessons at a Glance

1st Grade

From Shoots to Roots: The Purpose of Plant Parts

Overview:

In this unit, students investigate the driving question, “How do the structures of plants help them grow and thrive?” After creating garden agreements together, students begin the unit by making observations and developing models in order to explain how different structures such as roots, stems, and leaves help the plant survive and grow. Then, students investigate different types of roots to deepen their understanding of how structures help the plant. This leads students to apply their knowledge about structures of roots in order to design a stand for a garden sign inspired by nature. Students further develop their understanding of the function of stems and leaves through investigations, and finish the unit by creating their own model that demonstrates how all of these structures work together in a system. This unit is designed for students to make progress towards **Performance Expectation 1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.**

From Roots to Shoots: The Purpose of Plant Parts	
NGSS Performance Expectation	1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
Driving Question	How do the structures of plants help them grow and thrive?
Lesson 1	Welcome to the Garden Classroom! Students introduce themselves, create group agreements, listen to a story about a rainbow, and then go on a search for different colors in order to begin to form a personal connection with the Garden Classroom.
Lesson 2	Discovering Plant Structures Students make observations of a model in order to construct explanations for how different structures (roots, stems and leaves) help plants survive and grow.
Lesson 3	Illustrating Plant Structures Students develop a model in order to construct explanations for how different structures (roots, stems, leaves) help the plant survive and grow.
Lesson 4	Rootin’ for Roots Students observe different types of roots in order to construct explanations for how different root structures help plants survive and grow.
Lesson 5	Designing Garden Sign Stands Inspired by Nature Students design a solution to create a better garden sign stand based on their observations of the structures of roots .
Lesson 6	Stem Studies Students construct explanations about the different colors of celery stems and leaves that have been taking up colorful water in order to determine the function of stems .
Lesson 7	Learning About Leaves Students develop a model about the structure of leaves (size and shape) in order to determine how the leaves get what they need to make their own food .
Lesson 8	Making Our Own Plant Models Students develop a model in order to demonstrate their understanding of how roots, stems and leaves work together as a system to get the plant what it needs to survive and grow .

Discovering Plant Structures



Objective: Students make observations of a model in order to construct explanations for how different structures (roots, stems and leaves) help plants survive and grow.



1st GRADE

INDOOR OR
OUTDOOR

ANY SEASON

45 MIN

Lesson Summary

In this lesson, one student gets dressed up as a plant while the rest of the class discusses how each structure (roots, stems, leaves) helps the plant survive and grow. Then students brainstorm edible examples of each structure.

Next Generation Science Standards

Disciplinary Core Idea

LS.1.A. Structure and Function - All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

Science and Engineering Practices

Constructing Explanations and Designing Solutions - Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence-based accounts of natural phenomena and designing solutions.

Developing and Using Models - Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization or storyboard) that represent concrete events or design solutions.

Crosscutting Concepts

Structure and Function - The shape and stability of structures of natural and designed objects are related to their function(s).

Systems and System Models - Objects and organisms can be described in terms of their parts and systems in the natural and designed world have parts that work together.

Materials

- Photocopied sentence frames to display (available at the end of the lesson)
- Two different looking plants or weeds
- White Board or Chart Paper
- Markers
- 6 Plant Part Costume (described in preparation section below)
- 6 Plant Part Poster (described in preparation section below)
- Pencils
- Access to running water to wash produce
- A cutting board and knife to chop produce

Preparation

- Create a 6 Plant Part Costume. You can use the following materials, or come up with other creative means to include each plant part:

1. **Roots** = Mop head
2. **Stem** = Green robe
3. **Leaves** = Big felt leaves that students can hold in their hands
4. **Flowers** = A headband with flowers on it
5. **Fruits and Seeds** = A toy or real fruit that shows the seeds inside

- ❑ Create a 6 Plant Part Poster. To do this, write “Structure and Function in Plants” along the top of a piece of chart paper or a whiteboard. Then draw a picture of a plant on the poster, including all 6 structures: Roots, Stems, Leaves, Flowers, Fruits and Seeds. Do not label anything yet.
- ❑ Learn the chorus of **Roots, Stems, Leaves** by the Banana Slug String Band.
- ❑ Write the following along the bottom half of the piece of chart paper or whiteboard: “Things Plants Need to Grow.” Leave room underneath to record students’ ideas.



Teacher Background

All plants have structures, or physical parts, that perform specific functions, or jobs, to help the plant live, grow and reproduce. There are also edible examples of every plant part. A detailed description can be found on the last page of this lesson plan, which can also serve as an in-hand reference while teaching the lesson.

Engage

1. Hold up two very different plants and have students do a Think-Pair-Share.
 - a. **Think:** First, ask them to think about the answer to your questions quietly to themselves: *How are these plants different from one another?*
 - b. **Pair:** Read the first sentence frame aloud: *The plants are different from one another because ...* Then ask students to share their answers to the question you posed with a partner, using complete sentences.
 - c. **Share:** Finally, invite students to share ideas out to the whole group, again using complete sentences. Accept all answers.

Whenever students discuss science with one another, they are practicing English Language Arts as well as Science. Providing sentence frames supports all students, and particularly English Language Learners, with helpful scaffolding for producing complete sentences in these discussions.

Relevant Common Core English Language Arts standards

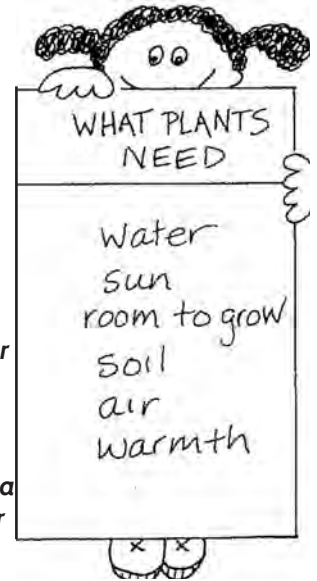
CCSS.ELA-LITERACY.SL.1.1

Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.

CCSS.ELA-LITERACY.SL.1.6

Produce complete sentences when appropriate to task and situation.

2. Repeat the **Think-Pair-Share** activity, using the second sentence frame, for a second question: **How are these plants similar to one another?** If students are not familiar with the word similar, you can define it as “like one another.”
3. If no one mentions it during the share out, add the following information:
One similarity between all plants is that they need the same things to grow.
4. Read aloud the third sentence frame and have students use that language to share ideas about what plants need to live and grow. As they share out, record a list of their ideas. Make sure the following make the list: Sun, water, air, and minerals, which are usually found in soil.
5. Explain – **Another similarity between plants is that they all have certain structures, or parts, that help them get what they need.**



Explore and Explain

1. **Today we are going to explore the structures and functions of plants. A structure is a physical part of something. Everyone touch your nose. A nose is a structure on your body. And each structure has a function, or job. Whisper to someone sitting next to you: What do you think is a function, or job, of the nose.** Have students share out and accept all answers.
2. **Everyone point to another structure on your face. Turn back to your neighbor and whisper: What is that structure, and what is its function?** Have students share out and accept all answers.
3. **Now let's find out what structures plants have, and figure out what function each structure serves.**
4. Use the 6 Plant Part Costume to “turn a student into a plant.” Ask for a volunteer to stand in front of the class. **I'm going to perform a magic trick and turn this student into a plant!**
5. As you add each part of the costume, say the name of the structure and ask students if they have ideas about the function of that structure. For example, as you place the mop on the student's feet, you might say: **Now I'm adding the roots. How do you think the roots help the plant get what it needs to survive and grow? What makes you think that?** Have students **Think-Pair-Share**. Encourage them to look at the structure for clues about what its function is. For example, roots are stringy and grow underground, and these characteristics help them stabilize the plant and soak up water from different parts of the soil. As students share out, guide students to connect the structure of the plant to its function.
6. Add in any important information they may have missed about the roots' function (see the in-hand reference sheet on the final page of this lesson for more information on each plant part).
7. Guide students in acting out that function together as a class. For example, you might say: **Everyone, hold your hands down near the ground and pretend your fingers are roots, drinking water and minerals up from the soil. SLURP!**
8. On your Plant Poster, write the word “roots” and draw a line (or invite a volunteer student up to draw a line) connecting the word “roots” to the roots on the plant pictured.
9. Ask students: **Do you eat any roots?** Accept all answers and add in your own examples.
10. Repeat steps 1-6 for roots, stems, and leaves, Add flowers, fruits and seeds more briefly, simply explaining that some plants also have flowers, fruits and seeds, which all help them make new, baby plants. When you finish, you should have a student in a full plant costume and a poster with the plant with all 6 structures labeled. Save your Plant Structures poster for **G1, L3: Illustrating Plant Structures**.
11. Ask your students: **Is this person now really a plant? Is this picture a plant? Of course not! These are two types of models of plants. A model is a tool for representing our ideas. We can use models, such as drawings, to share our ideas and explanations for how things work. And as we learn new information, we can change our models to show how our thinking has changed.**
12. Thank your student volunteer and dismiss them. Then teach your students to sing the chorus of **Roots, Stems, Leaves** by the Banana Slug String Band and sing it together.

Elaborate and Evaluate

1. In **G1, L3: Illustrating Plant Structures**, students will find a garden plant to observe, illustrate and label a plant with all its structures.

Celebrate

Enjoy a snack together that incorporates all of the 6 plant structures, such as a lettuce leaf wrapped around chopped carrots, celery, broccoli, and a cherry tomato. Or go around the garden together, stopping to harvest from edible plants. At each one, ask students to identify the plant part they'll be eating, ask what made them think it was that part, and then enjoy that piece of produce together.



Extensions

- ✦ Read a relevant literature book to your students, such as **Tops and Bottoms** by Janet Stevens. You can also pause regularly to have students ask and answer questions about key details in the text. When finished, ask students to discuss the central message or lesson of the story.
 - ✦ **CCSS.ELA-LITERACY.RL.1.1** – Ask and answer questions about key details in a text.
 - ✦ **CCSS.ELA-LITERACY.RL.1.2** – Retell stories, including key details, and demonstrate understanding of their central message or lesson.
 - ✦ **CCSS.ELA-LITERACY.RL.1.3** – Describe characters, settings, and major events in a story, using key details.
- ✦ Read a relevant informational text about how plants get what they need to survive and grow with your students. You can find texts in your school's English Language Arts curriculum, or by using a free, searchable online library of nonfiction books and articles categorized by grade-level, such as that found at readworks.org.
 - ✦ **CCSS.ELA-LITERACY.RI.1.1** – Ask and answer questions about key details in a text.
- ✦ Work with your students to write an informative text in which they name the topic (i.e., how plants get what they need to survive and grow), supply some facts about the topic, and provide some sense of closure.
 - ✦ **CCSS.ELA-LITERACY.W.1.2** – Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
- ✦ Work together with students to describe their last meal in terms of plant parts. **What kind of food did you have for lunch? Let's see if we can figure out how many plant parts you ate for lunch today.** Help them trace their peanut butter and jelly sandwich, for example, back to ground-up seeds (peanut butter) and crushed fruit (jelly) on ground-up and baked seeds (bread).

In-Hand Reference – The Six Plant Parts

Roots

All plants have roots. The root, the part underground, anchors the plant and absorbs water and minerals from the soil. Some plants that store a large amount of starch in their roots have become important in our diet, such as carrots, beets, radishes, and turnips.

Stems

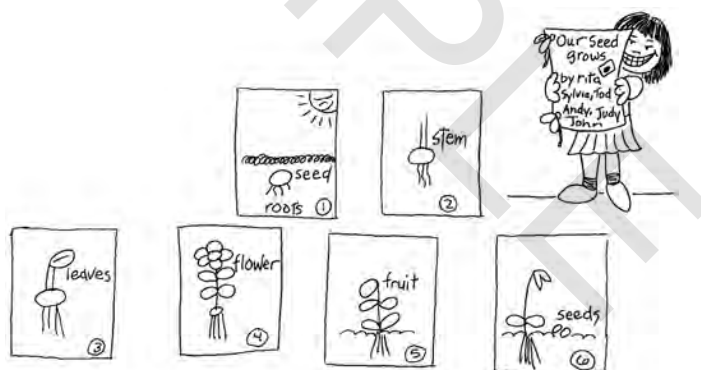
All plants have stems. The stem supports the plant and acts as the transportation unit to move water and minerals from the roots and sugars from the leaves to other parts of the plant where minerals are needed. Some stems we eat are asparagus, celery, broccoli stems, sour grass, and sugar (from sugar cane).

Leaves

All plants have leaves. The leaf is a flattened or extended part of the plant that grows from the stem. Leaves are the main food-producing part of the plant. They produce food through a process called photosynthesis, using carbon dioxide, sunlight, and water. We eat leaves such as lettuce, spinach, chard, basil, cabbage, and mint.

Flowers, Fruits and Seeds

Some plants, known as flowering plants or angiosperms, have flowers. The flower is the reproductive part of a plant. Once pollinated, the flower gives rise to fruits and seeds. Seeds contain baby plants. Fruits are the outer coverings that surround and protect the seeds. Some flowers that we eat are cauliflower, broccoli, brussel sprouts, and artichokes. Some ornamental flowers such as borage, nasturtiums and calendula are also edible. Some fruits we eat are apples, plums, zucchini, cucumber, tomato, peppers, pumpkins, and green bean or pea pods. Some seeds we eat include peas, corn kernels, sunflower seeds, beans, nuts, and wheat.



Fruit or Vegetable?

It can be confusing to know what to call a vegetable and what to call a fruit. This is because “vegetable” and “fruit” are culinary terms describing different types of food from plants. Essentially, fruits are the sweeter of the two. “Fruit,” however, is also a botanical term for one of the six plant parts. Botanically speaking, the fruit is the part of the plant that carries the seeds. While all culinary fruits are also botanically considered fruits, vegetables can come from any part of the plant. There are, for example, root vegetables, leaf vegetables, and the like. And so there can, in fact, be fruit vegetables, which are culinary vegetables that come from the fruiting body of the plant. Examples include tomatoes, cucumbers and eggplants.

The plants are different because ...

SAVED



The plants are similar because ...

SAMPLE

