
Plant Structures and Functions

Grade 4



Enduring Understanding

Plants and animals have structures that allow them to survive, grow, show certain behaviors and reproduce.

Essential Questions

What types of structures on plants help them to survive?

How do specific plant structures help it to survive?

Which plant structure do you think is most valuable in a plant's survival?

Objectives

1. Concept Objective: Understand the functions of the different structures of plants in its ability to survive in its habitat.

2. Lesson Content: Plant parts have many different functions, but all aid the plant in its survival.

3. Skill Objective(s)

- a. Identify the structure of a typical plant (leaves, stem, roots, flower).
- b. Describe the function of the major parts of a plant.
- c. Explain how the parts of a plant are necessary for its survival.
- d. Write an opinion piece that explains which part(s) of a plant are the most important for its survival.
- e. Support opinions with reasons and information.

Key Vocabulary

Plant structure, root, stem, leaf, flower, petal, seed, fruit, sepal, stamen, pistil, ovary, pollen, pollination, and reproduction.

Time Required

3-4 daily lessons: 1-2 in-class lesson before the trip, the field trip to the Kenilworth Aquatic Gardens, and 1-2 in-class lesson after the trip

Materials

Books about different plants and plant structures, for example: *Plant Parts*, *The Life of Plants* by Louise Spilsbury, *Plant Growth*, *The Life of Plants* by Louise Spilsbury, *Plant Reproduction*, *The Life of Plants* by Louise Spilsbury, *Pond and River (DK Eye Witness Books)* by Steve Parker

Optional: Fiction book on the Lotus: *Lotus Seed* by Sherry Garland

Posters or photographs of different plants and their parts, specifically water lilies and lotus plants.

Websites for background information on water lilies and lotus plants:

<http://www.pondplantgirl.com/lily-lotus.html> or <http://www.simple-expressions.org/2007/12/is-lotus-different-from-water-lily.html>

1 flower and/or plant for each student or group of students

White paper

Hand lens

Color pencils, crayons, or markers

If possible, cameras (or clip boards, paper and pencils) for the field trip

Background

- Plants typically have six basic parts: roots, stems, leaves, flowers, seeds, and fruit.
- Roots absorb nutrients from the soil and help support the plant so that it cannot be moved easily.
- Stems are the structure that hold the plant above ground or, if found underground, may provide food storage for the plant. They work to carry nutrients and water from the roots to the leaves.
- Leaves absorb the sun's light (through a process called photosynthesis) and turn it into food for the plant. They may also contain pores that allow water and air to enter and exit the plant. They vary in size and shape, but a few plants (such as cacti) do not have leaves as a way to allow water to enter.
- Flowers are the reproductive part of the plant. They are where new seeds are formed to continue the plant life cycle. They have particular looks and smells that attract insects and bees that help to pollinate the flowers. The male part of the flower (stamen) has pollen on it and when the pollen comes into contact with the female part (stigma), pollination begins.
- Seeds are often found inside of the fruit, but can also be found on the outside. Not all plants produce fruit.
- Fruit is the part of the plant that helps in protecting, transporting, and distributing seeds. Some fruits become a source of food for birds and other animals that eat the food and the excrete it in another place. Some seeds attach themselves to animal's fur when it comes into contact with the plant and is transported to a new location. Some seeds are simply blown to a new location by the wind.
- Water lily and lotus flowers have different plant and flower structures. See here for a good comparison: <http://www.pondplantgirl.com/lily-lotus.html>

Procedures/Activities

Prior to the field trip to the Kenilworth Aquatic Gardens:

1. Begin a discussion with the students about what they already know about the structural parts of plants (names and functions). Create a list of terms that students are familiar with regarding the structure of a plant. If there are terms that students are unfamiliar with, introduce those terms now.
2. After discussing the terms, look at or read about different plant structures and their functions in a science textbook, trade books, images you have collected, or websites. Instruct students that they are going to be exploring the parts of a plant by dissecting a sample plant, reading about different types of plants, taking notes on plant parts (either with a camera or through note taking and sketches) and creating a class plant reference book.
3. After the research has been done, spend a class period dissecting a flowering plant. Have a plant and a hand lens available for each student, or have students work in groups of 2 - 3 and provide a flowering plant and hand lens for each group. This will work best if you can use a plant that has roots and flowers attached to it. Instruct students to carefully dissect each part of their plant and transfer each part to their blank white paper. They will tape (or glue) each part to the paper and create a diagram by labeling each structural part of the plant as well as provide a brief description as to the function of each part.
4. For the second lesson, introduce the two plants water lilies and water lotus. Discuss with students what they know about each type of plant before doing research and compare what they know to what they have learned about plant structures thus far.

5. Spend time researching about the two different plants, by reading books, using online websites or showing photos of the two different types of flowers, a water lily and a lotus. *An optional connection would be to read/use the book *Lotus Seed* by Sherry Garland in your Language Arts lessons.

6. Instruct students that when they are on their field trip to the Kenilworth Aquatic Gardens, they will be looking for different types of plants, specifically the water lily and the lotus.

During the field trip to the Kenilworth Aquatic Gardens:

1. Come to the Aquatic Gardens to explore the ponds, wetlands via the Boardwalk and/or forest by the River Trail. As students go on their tour, stop in several locations to discuss what type of plants they observe. Give the students time to point out the different types of plants they see, whether or not they can identify the names.

2. Take time to make several stops to allow students (individually or in small groups) to take photographs (or sketch and take notes on white paper) of particular plants that they observe. They should take time to discuss/take notes on particular structures of the plant that are visible (stems, leaves) and parts that are not visible (roots, and possibly flowers depending on the time of year you are visiting).

3. Make a stop at the ponds to find both the water lotus and the water lily. (The best time to observe these ponds is late May – early September) Again, instruct students to take time to observe and record their observations of the two different types of plants. Discuss the difference you find in the two plants leaf structures (and flower structures, if possible). Discuss where the roots could be found on each plant.

After the trip to the Kenilworth Aquatic Gardens:

1. It's time to do some writing and creating! This portion may take several days to complete, as students will be asked to write and create a class plant reference book.

2. Each student (or group of 2 - 3 students) will select one plant that they either studied in class before the trip or observed while on their field trip to create a plant reference page for a class book. Included on the page should be an illustrated and labeled diagram of their plant and it's parts. It should also include a summary of the functions of each part of the plant. You may also want to have students include the type of habitat in which the plant can be found.

3. Collect all the plant pages and combine them together to create a class plant reference book.

4. Finally, discuss with students what they have found to be the most important aspect of a plants survival. Instruct students that they will write an opinion piece that explains what part of a plant's structure is the most important to its survival. They should provide facts from their research to support their argument. **If students conclude that there is not one most important part and that there are several important parts or that the parts are all equally important, allow that perspective as long as their writing is supported with evidence.*

5. Have students present their final work by sharing their writing pieces aloud.

Assessment

Students diagrams of their plant reference page to be included in the class book. Opinion writing piece that constructs an argument supporting which plant part they feel is essential for the plants survival with reasons and information to support their ideas.

Links to Next Generation Science Standards

For more info: <http://www.nextgenscience.org/sites/ngss/files/4.LS1%205.8.13With%20Footer.pdf>

4. Structure, Function, and Information Processing

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Students who demonstrate understanding can:

- 4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.** [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]
- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> Develop a model to describe phenomena. (4-PS4-2) Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) <p>Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> Construct an argument with evidence, data, and/or a model. (4-LS1-1) 	<p>PS4.B: Electromagnetic Radiation</p> <ul style="list-style-type: none"> An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) <p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) <p>LS1.D: Information Processing</p> <ul style="list-style-type: none"> Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified. (4-PS4-2) <p>Systems and System Models</p> <ul style="list-style-type: none"> A system can be described in terms of its components and their interactions. (4-LS1-1), (LS1-2)
<p><i>Connections to other DCIs in this grade-level:</i> N/A</p> <p><i>Articulation of DCIs across grade-bands:</i> 1.PS4.B (4-PS4-2); 1.LS1.A (4-LS1-1); 1.LS1.D (4-LS1-2); 3.LS3.B (4-LS1-1); MS.PS4.B (4-PS4-2); MS.LS1.A (4-LS1-1),(4-LS1-2); MS.LS1.D (4-PS4-2),(4-LS1-2)</p>		
<p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy –</i></p> <p>W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)</p> <p>SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2),(4-LS1-2)</p> <p><i>Mathematics –</i></p> <p>MP.4 Model with mathematics. (4-PS4-1),(4-PS4-2)</p> <p>4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)</p> <p>4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)</p>		