
Plants and Structure

Grade 1



Enduring Understanding

Plants (and animals) use their structure to help get what they need. Different types of plants have similar structures, but are not exact copies. Humans can use the model of plants structures to design human structures of a similar nature.

Essential Questions

How does the structure of plants help them get what they need to survive?
How does the structure of plants compare/contrast to other plants like them?
How can humans used the design of these structures to solve a problem?

Objectives

1. Concept Objective: Understand how the structure of plants help them to survive.
2. Lesson Content: Plants are similar to one another in having the same structure, but they are not exact replicas of one another.
3. Skill Objective(s)
 - a. Tell what the basic parts of a plant are and how they help the plant survive.
 - b. Identify how the structure of plants are similar and different to other kinds of plants (compare leaves of trees, compare roots on a flowering plant to the roots of a water lily).
 - c. Use observations to identify similarities and differences.
 - d. Construct a model mimicking plant roots to solve a problem.

Key Vocabulary

A **plant** is a living organism that produces its own food and has roots, stems, and leaves.

To **survive** is to live or remain living.

Leaves, stems, roots, seeds, flowers are all parts of a plant essential for its survival.

Roots hold plants in place and absorb water.

Leaves make food for the plant.

Stems hold the plant upright and transport materials up and down the plant.

Seeds make new plants.

Time Required

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

Materials

1. Books about plant structures, for example:
What's Inside Plants? by Anita Ganeri
Seeds, Stems, and Stamens : The Ways Plants Fit by Susan E. Goodman
Plant Book, Plant Parts and Their Uses by Pamela M. Hickman
Hungry Plants, Plants a First Look by Mary Batten
2. Photographs of different types of plant leaves, stems, roots and flowers.
3. Chart of a typical plant with space to label its parts.
4. If possible, clip boards, paper and pencils for the field trip to the Aquatic Gardens.
5. Trays of sand
6. Craft sticks
7. Glue

Background

- Plants have basic needs, including nutrients, air, water, light, and a place with sufficient space to grow.
- Plants have different structures that serve different functions in growth, survival, and reproduction
- The American Lotus is an emergent aquatic plant and sends leaves and flowers up through the muck and water from their rhizomes, or roots. The smooth, waxy water repellent leaves are supported above the water by a long petiole (stalk) that is attached to a stem. The leaves typically reach up to 2 feet in length and remain poised 3 to 6 feet above the surface, while thick rhizomes burrow into the mud below. The lotus flower is cup-shaped, ranges in color from white to pink and reaches an average span of 8 to 12 inches. Each blossom consists of approximately 15 petals and opens in the morning and closes at night. After about three days, the flower fades to yield a fruit that resembles a nut. The fruit, which consists of multiple chambers that hold individual seeds, is embedded in the surface of a 3-inch wide receptacle that looks like showerhead. (<http://homeguides.sfgate.com/size-lotus-flower-60763.html>)
- Water lilies have large leaves or pads that float on the surface of the water and are attached to the soil at the bottom of the pond by a long stem. The roots of a water lily are rhizomes, fleshy tubers that store nutrients. Water lilies live only in fresh water that is shallow and still, around the edges of lakes or in small ponds. The flowers stand above the water on slender stalks(<http://homeguides.sfgate.com/water-lilies-48316.html>).

Procedures/Activities

Prior to the trip to the Kenilworth Aquatic Gardens:

1. Ask students to discuss how their different body parts help them every day, such as: legs help us to walk, hands help us to hold objects, hair keeps us warm, eye lids protect our eyes, etc. Post an outline of a human body on a piece of chart paper and as students suggest how different parts help us, place a picture of that part on the outline, and then add words to label how that body part helps us every day.
2. Read book(s) with examples of plants and their structure, highlighting the information that describes how the structure helps plants to survive (i.e. roots hold the plants in place, leaves help absorb sunlight for food, etc.).
3. Discuss with the students what plants need to survive? You can connect back to ideas students have about what they need to survive and what animals need to survive. Discuss whether plants need these same things (air, water, food, shelter, etc). Choose one particular plant to use as an illustration. Create an outline of that plant on chart paper and have the students help you to identify and label parts, similar to what you did with the human outline. Label the stem, roots, leaves, flowers, and seeds. Continue the discussion to include a comparison of how plants are similar and different to humans.
4. Using illustrations of different types of leaves, stems, and root systems have students discuss what they see that is the same about the plant parts and what is different (ie - how are the leaves on a oak tree different from leaves of a maple; how are the root systems of oak trees different from ones of aspen trees).

During the field trip at Kenilworth Aquatic Gardens:

1. Come to the Gardens for a tour of the ponds, walk through wetlands on the Boardwalk and/or forest through the River Trail. As students go on their tour, stop under a large tree to begin a discussion about the structural parts of plants that you learned about in class. Use the tree to review the structure of plants and identify different parts of the tree: stem, leaves, (discuss where the roots may be located). If possible, try and compare two of the same type of plant to remind students of how plants are similar but not exactly alike.
2. Move to the pond area where the lotus and water lilies are located. Repeat this discussion by identifying the parts of these plants. Compare them to the parts of the tree. How are they the same? How are they different? How does the structural parts of the lotus plants and water lily plants still help the plant to get what it needs...even though it may differ from the structural parts of the tree?
3. Students will repeat this dialogue on a third type of plant, but this time, have students work with a partner. Together, they should choose a plant that they would like observe. Have them discuss and identify the same parts of the plant, being sure to identify the names of each part and how each part of the plant helps it to get what it needs. If you are able to bring paper, pencils and clip boards to the Gardens, have the partners draw a diagram of their selected plant and label the structural parts of the plant.

After the trip to the Kenilworth Aquatic Gardens:

1. Here's where the design part of the lesson comes alive! Have students review the diagrams that they created on their trip to the aquatic gardens. Compare their diagrams to the one created in class together prior to the field trip.
2. Present the students with a problem to solve. Discuss, specifically, how the roots of the plants help to stabilize the plants, in addition to allowing them to soak up water. Discuss what would happen to a plant if it didn't have roots and a storm with high winds were to come through the area. Discuss how some plants have roots that grow deep in the soil to keep it stable, and others grow in a more shallow path if/when it lives in a habitat where water is scarce. Review what the roots of the water lilies grow.
2. Discuss how we don't want our homes and other buildings (stores, schools, etc) to fall down if there was a strong wind as well. Lead the students to the idea that the foundation of a building is often built underground to help keep it stable.
3. Divide the students into small groups and challenge them to work together to create a model of a small house using craft sticks and glue (and/or any other materials you may have available) in a tray of sand. Explain that they will be testing the strength of their structure by placing it in front of a fan (to represent high winds) to see if it will hold up or fall down. Remind them to think about the function of the root system in plants that help to keep them stationary. Use a floor or table fan to have students test their structure in a "windy situation".

Assessment

Student diagrams of the parts of a plant created during the field trip. The student models of a building created during the design part of the class.

Links to Next Generation Science Standards

For more information: <http://nstahosted.org/pdfs/ngss/20130509/topic-grouped/1stGrade.pdf>

1.Structure, Function, and Information Processing

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Students who demonstrate understanding can:

- 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.*** [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]
- 1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]
- 1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.** [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</p> <ul style="list-style-type: none"> Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1) Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1) <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <ul style="list-style-type: none"> Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2) <p style="text-align: center;"><i>Connections to Nature of Science</i></p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> Scientists look for patterns and order when making observations about the world. (1-LS1-2) 	<p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> 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. (1-LS1-1) <p>LS1.B: Growth and Development of Organisms</p> <ul style="list-style-type: none"> Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2) <p>LS1.D: Information Processing</p> <ul style="list-style-type: none"> Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1) <p>LS3.A: Inheritance of Traits</p> <ul style="list-style-type: none"> Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents. (1-LS3-1) <p>LS3.B: Variation of Traits</p> <ul style="list-style-type: none"> Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2),(1-LS3-1) <p>Structure and Function</p> <ul style="list-style-type: none"> The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1) <p style="text-align: center;"><i>Connections to Engineering, Technology, and Applications of Science</i></p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. (1-LS1-1)
Connections to other DCIs in first grade: N/A		

<p><i>Articulation of DCIs across grade-bands: K.ETS1.A (1-LS1-1); 3.LS2.D (1-LS1-2) 3.LS3.A (1-LS3-1); 3.LS3.B (1-LS3-1); 4.LS1.A (1-LS1-1); 4.LS1.D (1-LS1-1); 4.ETS1.A (1-LS1-1)</i></p>	
<p><i>Common Core State Standards Connections:</i></p> <p>ELA/Literacy –</p> <p>RI.1.1 Ask and answer questions about key details in a text. (1-LS1-2),(1-LS3-1)</p> <p>RI.1.2 Identify the main topic and retell key details of a text. (1-LS1-2)</p> <p>RI.1.10 With prompting and support, read informational texts appropriately complex for grade. (1-LS1-2)</p> <p>W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). (1-LS1-1),(1-LS3-1)</p> <p>W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-LS3-1)</p> <p>Mathematics –</p> <p>MP.2 Reason abstractly and quantitatively. (1-LS3-1)</p> <p>MP.5 Use appropriate tools strategically. (1-LS3-1)</p> <p>1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols $>$, $=$, and $<$. (1-LS1-2)</p> <p>1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1-LS1-2)</p> <p>1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (1-LS1-2)</p> <p>1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (1-LS1-2)</p> <p>1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-LS3-1)</p>	