

SIEMENS STEM DAY ACTIVITY

LEAF IT TO ME

REAL-WORLD SCIENCE TOPICS

- An exploration of how leaves of different plants use specialized characteristics to collect sunlight, store and conserve water, and take in carbon dioxide so that they can produce food for the plant.
- An exploration of external parts in plants and how different plants use these external parts (particularly leaves) to survive in their environment.
- An exploration of how specialized characteristics, called adaptation, in living things provide survival advantages to certain organisms and that those organisms are more likely to survive.

DURATION

1 hour

LEVEL OF DIFFICULTY

2

GRADE RANGE

K-2

OVERVIEW

In this activity, students will participate in a leaf scavenger hunt and assemble a basic leaf collection. They will use their collection to explore how diversity in characteristics such as leaf size, thickness and texture help plants survive in their environment.

TOPIC

Plant Structure and Diversity

OBJECTIVE

After completing this activity, students should be able to recognize that there are many kinds of plants with special features that help them survive. Students in grades 2–3 should also be able to explain how these special leaf adaptations help the plant survive in its environment.

NGSS THREE-DIMENSIONS

Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
<p>Planning and Carrying Out Investigations Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.</p> <p>Asking Questions and Defining Analyzing and Interpreting Data Use and share pictures, drawings, and/or writings of observations.</p> <p>Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.</p> <p>Constructing Explanations and Designing Solutions Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena.</p>	<p>1-LS1.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, fruit) that help them survive and grow.</p> <p>2-LS4.D: Biodiversity and Humans There are many different kinds of living things in any area, and they exist in different places on land and in water.</p>	<p>Patterns Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</p> <p>Structure and Function The shape and stability of structures of natural and designed objects are related to their function(s).</p>

BACKGROUND INFORMATION

What is the purpose of a leaf?

Unlike humans and other animals, plants cannot consume food for energy. Because of this, they must produce their own food through a process called photosynthesis. The part of the plant responsible for this process of making food is the leaf. For the leaf to make food through photosynthesis, it must have water, sunlight and carbon dioxide.

Why do leaves have unique characteristics?

Plants often have specialized characteristics or adaptations that help the leaves collect and save water, gather sunlight and carbon dioxide. These adaptations often depend on the type of environment where the plant lives and thrives. Plants that live in dry areas have special characteristics or adaptations that help them gather, save, and store water when it is available. Other plants that live in the shaded canopy of other plants have adaptations that allow them to gather more sunlight.

Why is there such a variation in the traits of living things such as plants?

Organisms vary in how they look and function based on their inherited genetic information. The environment, in addition to natural selection and other evolutionary processes affect the traits that a population of organisms develops. Because of inheritance and these evolutionary processes, a wide range of diversity forms within living things.

KEY VOCABULARY

Plant

Leaf

Characteristics

Variation

Survival

Environment

MATERIALS NEEDED FOR ACTIVITY

- A leaf with at least one unique characteristic (i.e. having hair, being extremely large or small, having spine-like structures, having a pigment other than green, being very thick, etc.)
- Set of “Group Name Labels” (templates included)
- Set of “Description Cards” (templates included)
- Appropriate student handout (Grade K–1 and 2–3 student handouts included)
- Plastic or paper grocery store bags
- Hand lens

TEACHER PREPARATION

Before students arrive you will need to print one set of “Group Name Labels” (template included). These need to be cut out and posted in areas around the room. Students will be sorting their leaf collection into these groups so make sure they are clearly visible, spread out and that there is a table or counter for the leaves to sit.

Print one set of “Description Cards” (template included) and cut out.

Grades K–1: These cards are for your reference and to discuss with the students in “Wrap-up” section of the activity as you see fit. **(Depending on the level of your students, some 1st grade teachers may want to follow the instructions for Grades 2–3 outlined below.)**

Grades 2–3: Place one card at the appropriate table/counter you labeled in the first step. If you have a large class you may want to print two sets these cards.

You will also need to find an area around the school that has plenty of vegetation and foliage. Safety Note: Make sure this area is free of poison ivy and/or other plants that are dangerous.

ACTIVITY STEPS

1. **Warm-up Activity:** Provide each student with a handout and ask them to quickly draw what they believe a leaf looks like in the box at the top of the page. Instruct them to use correct colors as they draw. Students capable of listing characteristics of leaves should do so in the box to the right of their drawing.
2. Once students have had a few minutes to sketch a leaf, lead a class discussion about leaves.

Grades K-1: Ask students to describe some characteristics of a leaf. At this point, students are likely to give very general/common descriptions of leaves. Ask if they think all plants have leaves that look the

same. At this point, all descriptions and answers should be accepted. Explain that plants cannot eat food like humans and animals and therefore must make their own food using the sun's energy. Reveal that this is the leaf's job.

Grades 2–3: Tap into prior knowledge by asking the following questions:

- “What is the job of the leaf?”
- “Are all leaves are the same shape, size, color, and texture?”
- “Why are they all different?”

Answers will vary based on background knowledge and at this point all answers should be accepted. Remind students that the job of a leaf is to produce food for the plant by using energy from the sun's light. As you move to the next step, encourage students to continue pondering why leaves of different plants would have different traits or characteristics.

3. To pique student's interest before moving on to the leaf collection, show students a unique leaf that you have collected prior to beginning this lesson. This leaf could be extremely large or small, hairy, spiny, a color other than green, smelly, or funny shaped. Allow students to look at and touch the leaf. Explain that they will be exploring and collecting a variety of leaves in this activity and observing how they are different and unique.
4. **The challenge:** Explain to students that they are going on a leaf scavenger hunt. Refer students to the “Scavenger Hunt” on the student handout (There are two handouts included in this activity. One is a lower level handout for grades K-1. Choose the appropriate handout for your students). Explain that they will work with a partner to find as many of the different leaf types described on the handout as possible.

Grades K–1: Teachers at this level may need to read through the scavenger hunt list on the “Grades K–1 Student Handout” and explain any word that may be unfamiliar to students.

Grades 2–3: At this level, allow students to read through the scavenger hunt list on the “Grades 2–3 Student Handout” and ask for clarification if needed.

Explain to students that as they find a leaf type from the list on the handout, they must check the box next to the leaf, gently pull it from the plant and add it to their collection bag. Point out that careful observations of the leaves must be made to see things like hairs, spines and textures. Remind students, before taking them to the designated hunting area, that they must be careful of plants with sharp spines, as they can be dangerous.

5. Give students a collection bag and lead them to the designated hunting area that is free of poisonous type plants such as poison ivy. Teachers may want to put up a reward for the group who is able to check off and collect the most leaves from the list.

8. Once students have had about 30 minutes to collect as many different leaves as possible, reassemble in the classroom. Explain to students that they must sort their leaves into groups around the room.

Grades K–1: Students at this level should simply sort their leaves into the groups labeled around the room. After everyone has sorted their leaves, give each student a hand lens and have them do a gallery walk observing the different leaves at each station. Encourage students to use a variety of senses as they make observations including touch, smell and sight.

Grades 2–3: Students will sort their leaves into groups labeled around the room. As they move to each station sorting their leaves, students at this level should read the information card displayed at each station. Once students have sorted their leaves, give them the opportunity to revisit each station with a hand lens and their student handout. They should complete questions 1–6 as they move around the room making observations.

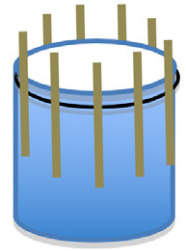
9. **Wrap-up:** Ask students to draw another leaf in the box provided on the student handout. This drawing should include one or two of the characteristics they observed on their scavenger hunt.

Grades K-1: Ask students what they learned about leaves from doing the scavenger hunt. Expand on the idea that leaves, like all living things, have lots of variation or differences. A leaf can be big, small, skinny, smooth, shiny, thick, spiny, or hairy but all leaves have the same job, which is to collect sunlight and make food for the plant. The teacher may want expand on why these special characteristics are helpful to the plant. If so, read through the description cards for each type of leaf with the students.

Grades 2–3: Revisit the question posed in the warm up, “why do different plants have different leaf characteristics?” Give students a chance to respond and discuss this question based on what they learned from the activity. Expand on their answers by explaining that the unique characteristics help the leaf better do its job of making food in certain environments. For example, the big leaves help plants that grow in shady areas collect enough sunlight to make food. Explain that although all leaves have the same purpose of collecting light and making food, sometimes they need special traits to help them better do their job in their particular environment. Students at this level should use the area below their drawings to summarize how the special characteristics they sketched help the plant survive.

EXTENSION ACTIVITY

Water is an important substance needed in the process of photosynthesis. Leaves on plants that live in dry, windy, hot environments often have adaptations or characteristics that help them conserve water. Set up a demonstration showing how thick covering on leaves or hairs can help conserve water. Fill three clear plastic cups to the top with water. Make sure the water level is the same on each cup. Cover one cup with clear plastic wrap. Place a rubber band around the rim of a second cup. Tuck 15 to 20 toothpicks, pieces of jute or other thick “hair-like” objects under the rubber band every centimeter or so. Make sure that half of the hair-like object is sticking up above the cup’s brim as shown to the right. The toothpicks should be evenly spread around the cup. These toothpicks represent hairs protruding from the surface of a leaf. The third cup of water is the control and will be unchanged. To represent wind or airflow moving over the leaf surface, a fan should be aimed at the cups on a low setting. Have students predict what they think will happen in each of the cups. Check the cups the next day and see what has happened in each.



Sources:

Videos:

<http://www.watchknowlearn.org/Category.aspx?CategoryID=2307>

Websites:

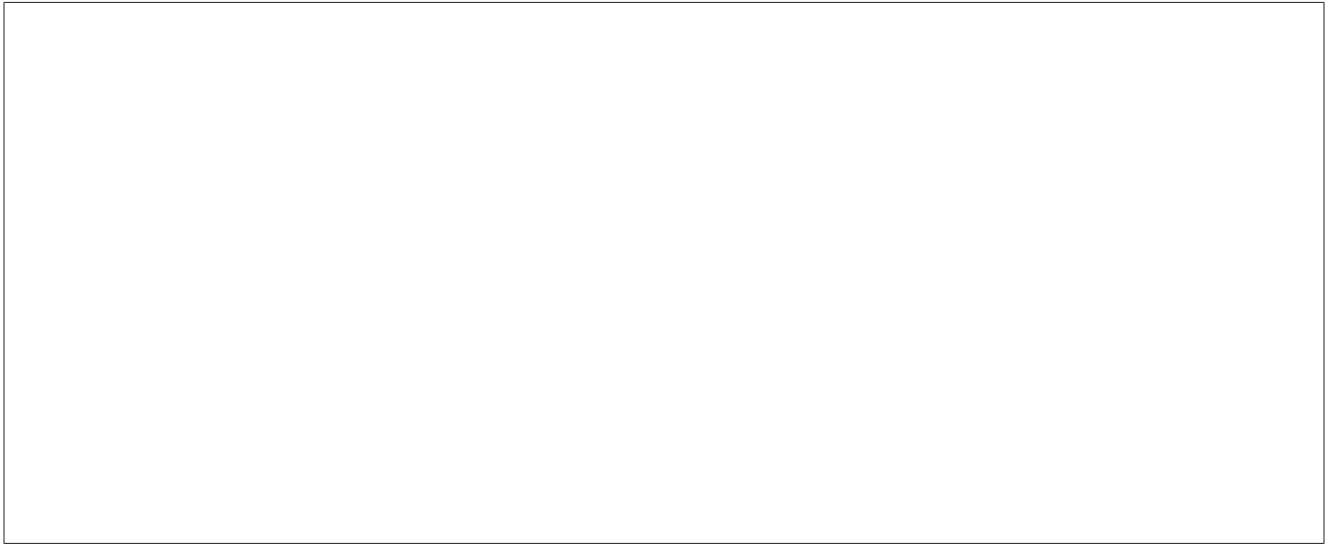
<http://www.abdnha.org/just-for-kids/anza-borrego-just-for-kids-plants.htm>

http://www.smith.edu/garden/exhibits/plant_adaptation/topic%26pdfs.html

<http://www.mbgnet.net/bioplants/adapt.html>

LEAF IT TO ME | GRADES 2–3

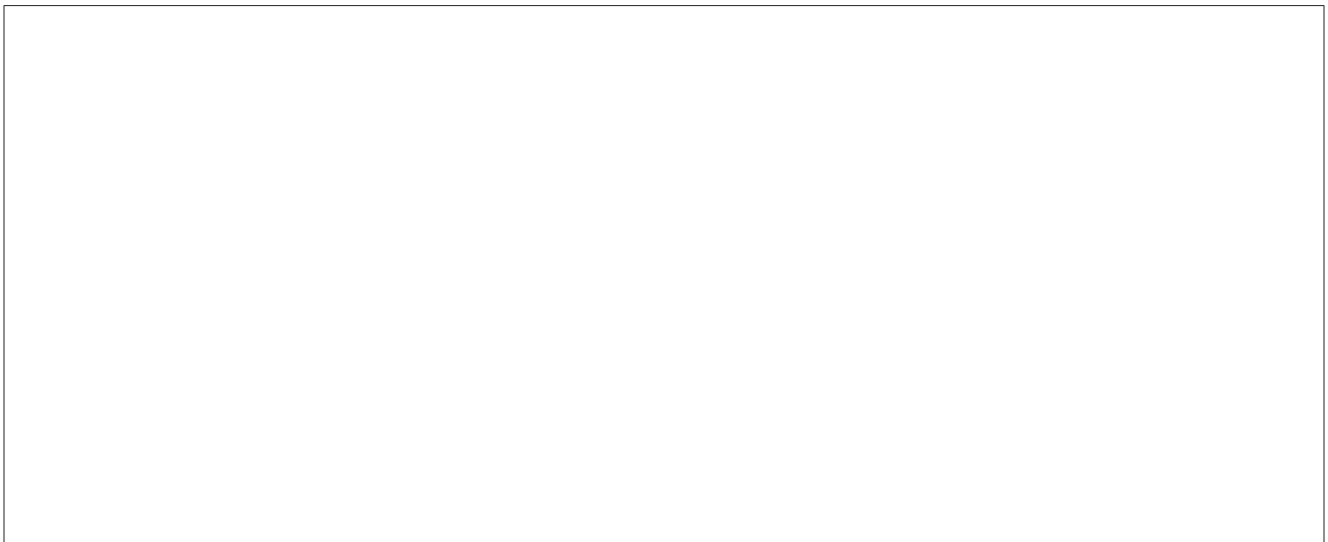
In the box below, draw a picture of a leaf using correct colors.



SCAVENGER HUNT CHALLENGE

- Thick leaf
- Small leaf
- Leaf with strong smell
- Large leaf
- Spiny or “pokey” leaf
- Climbing leaf
- Shiny, smooth leaf
- Funny shaped leaf
- Hairy or fuzzy leaf

Draw a leaf that shows one or more of the characteristics you learned about today.



LEAF IT TO ME | GRADES K-1

Directions: In the box below, draw a picture of a leaf using correct colors. List traits or characteristics of leaves in the blanks next to the box.

Leaf Characteristics

Scavenger Hunt Challenge:

You and a partner will try and find as many of the following leaf types as possible. As you collect a specific leaf type, check it off the list.

- | | | |
|--|--|---|
| <input type="checkbox"/> Hairy or fuzzy leaf | <input type="checkbox"/> Shiny, smooth leaf | <input type="checkbox"/> Needle like leaf |
| <input type="checkbox"/> Thick leaf | <input type="checkbox"/> Spiny or “pokey” leaf | <input type="checkbox"/> Leaf with strong smell |
| <input type="checkbox"/> Large leaf | <input type="checkbox"/> Non-green colored leaf | <input type="checkbox"/> Climbing leaf |
| <input type="checkbox"/> Small leaf | <input type="checkbox"/> Funny shaped leaf | <input type="checkbox"/> Leaf that float |
| <input type="checkbox"/> Narrow, long leaf | <input type="checkbox"/> Leaf with lots of veins | |

Answer these questions using the knowledge you gained from the information cards at each station.

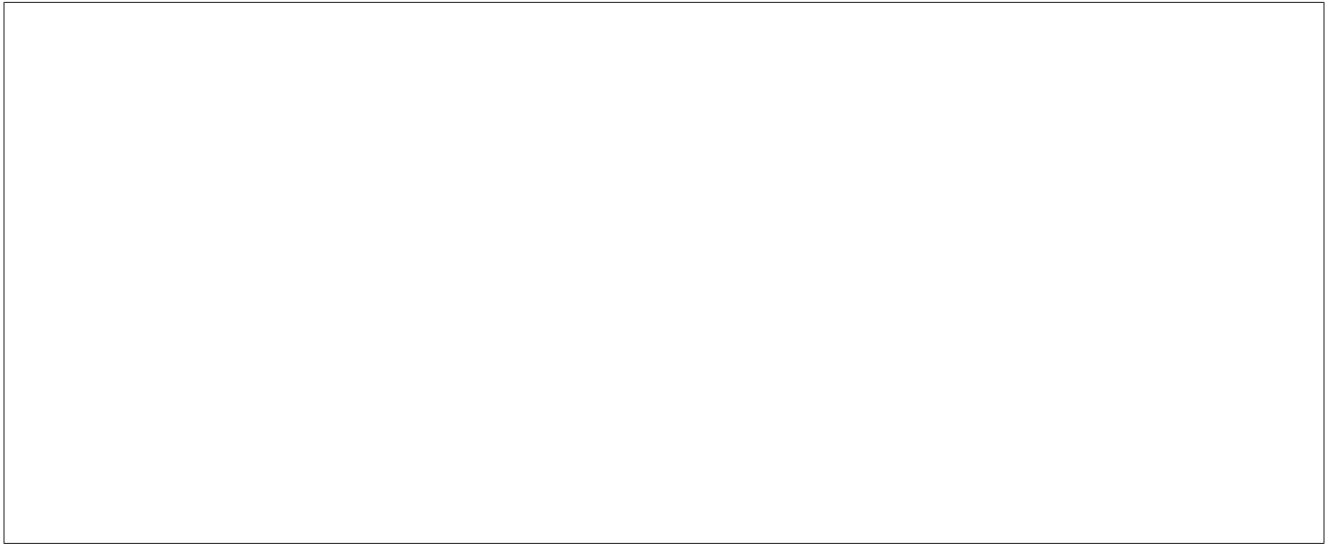
- Plants with small leaves commonly grow in what type of climate? _____
- Large leaves help plants collect sunlight in _____ areas.
- Leaves with sharp spines help keep _____ from eating them.
- The veins you see in the leaf are responsible for carrying what to the leaves? _____

LEAF IT TO ME | GRADES K-1

5. Why do some plants climb up objects?

6. Why are leaves of some plants thick and succulent?

Draw a leaf that depicts one or more of the special traits you learned about today.



Write about the leaf characteristic(s) you sketched. Explain how it helps the plant grow and survive.

Hairy or Fuzzy

Large

Small

Shiny and
Smooth

Spiny or “Pokey”

Thick

Smelly

Climbing

Lots of Veins

Hairy or Fuzzy Leaves

In windy environments, the hairs break up the air flowing over the leaf. This keeps the plant from losing water it needs to make food. Hairs can also be unpleasant for animals that like to eat plants. The hairs make it less likely to be eaten. In very sunny environments, thick, fuzzy, soft hair on the leaf's surface can protect the leaf from getting too much sunlight.

Large Leaves

Plants with large leaves typically grow in shady areas. These plants need large leaves to collect as much light as possible so that they can make enough food to survive.

Small Leaves

Plants with small leaves are better suited to grow in very sunny and dry areas. Because there is ample sunlight available, the leaves do not need to grow very large to collect enough light to make food for the plant.

Shiny and Smooth Leaves

Leaves with a smooth shiny look to them often have a clear, thick, skin-like covering over them which helps keep water from evaporating too quickly.

Spiny or “Pokey” Leaves

Spines on leaves make it unpleasant for animals to eat. These sharp spines protect the leaf from being eaten by animals.

Thick Leaves

Plants that live in extremely dry areas will store lots water in their leaves during the occasional rains. This causes their leaves to be thick and succulent. Plant with thick leaves can often go long periods of time without needing rain or water.

Smelly Leaves

Some leaves produce an odor that can repel insects. This helps keep harmful insects from damaging the leaf of the plant.

Climbing Leaves

Leaves need and want sunlight. Some plants must use special leaves that can climb up objects to find enough sunlight to make food.

Leaves with lots of veins

Veins help carry water to the leaf. This water is needed to help make food for the plant. Veins also help carry the food that is made in the leaf to other parts of the plant.

Directions: Answer these questions using the knowledge you gained from the information cards at each station.

1. Plants with small leaves commonly grow in what type of climate?

Hot/Dry

2. Large leaves help plants collect sunlight in **shady** areas.

3. Leaves with sharp spines help keep **animals** from eating them.

4. The veins you see in the leaf are responsible for carrying what to the leaves?

Water

5. Why do some plants climb up objects?

They climb up objects toward the sun so that they are better able to collect the sun's light.

6. Why are leaves of some plants thick and succulent?

The leaves of some plants are thick and succulent because they store extra water.