

CALIFORNIA
ACADEMY OF
SCIENCES

What color is your leaf?

grade level: K-2

subject: Life Sciences; Patterns

duration: Prep Time: 30 min; Activity Time: 1 hr

setting: Outdoors/Classroom

materials

- » clipboards
- » student data sheet (1 per pair)
- » pencils
- » color pencils or crayons (shades of green, brown, red and green)

scientific terms for students

environment: the area in which something exists or lives.

adaptation: what a plant or animal has or does that helps them live.

response: how a plant behaves toward conditions in its environment (such as exposure to sunlight) that can change how it looks and feels.

Background for Educators

Plants have basic needs just like all living things. Plants require light, air, water, and nutrients, (known as the acronym, LAWN) for survival. Plants meet the needs of their environment in a variety of ways. For instance, leaf adaptations aid in a plant's survival in different environments.

In hot, sunny, dry environments plants have developed adaptations to respond to high levels of sunlight and heat and very little water. Leaves are important for retaining valuable water and preventing excess heat absorption. Leaves tend to be small, leathery, or light in color, to protect themselves against the sun's rays. In moist, shady environments, the reverse occurs - light is now a limiting factor and water is more abundant. Leaves are often large and a rich to dark green color, to maximize sunlight absorption. These inherited characteristics are

objectives

Students will:

1. make observations and record information in a schoolyard and/or garden setting to describe leaf patterns in the natural world.
2. make inferences on how the sun and shade contribute to differences in leaf color and texture.

traits that are consistent for the plant from year to year.

Leaf characteristics are not entirely based on a plant's adaptation to its environment. Environmental conditions, such as water (drought, storms), soil nutrients, sunlight and weather, can all affect how a plant responds and grows. Leaf color and texture can change as a response to environmental conditions. These non-inherited characteristics are traits that can vary from year to year depending on the environmental conditions.

Leaf color can sometimes be indicative of whether a plant is stressed in its environment. If a plant is exposed to extreme heat and sunlight, leaves will display signs of heat stress and can even get sunburned! Excessive heat can cause an imbalance in transpiration (the process of giving off vapor containing water and waste products, especially through the stomata on leaves). Evaporation rates will exceed the rate that a plant can take in moisture, and the plant becomes dehydrated. Leaves can feel leathery and begin to show signs of yellow as the chlorophyll (the main photosynthetic pigment) deteriorates. And just like with humans when we get sunburned, leaves can take on a reddish purple tint, or develop what looks like freckles (dark red to brown spots).

Teacher Prep

Prior to the activity, identify a sunny and a shady location in the garden (school garden, yard, or neighboring area) to use for observations and data collection. Take in mind to choose plants in the sunny location that show traits that are responding to the sun, as mentioned in the Background for Educators. It doesn't have to be the same species, but kudos if the same species is found in both the sunny and shady location.

Teacher Tip: You can also make observations by looking at leaves in trees and larger shrubs. Note that this activity can still be accomplished if students are looking at only one plant. Students can observe leaves from the outermost parts of the tree that are exposed to direct sun and compare them to leaves growing in the shady inner reaches of that tree.

Introduction

1. You may begin the lesson by reviewing what plants need to grow and survive.
2. Explain to the class that they will be scientists using their science eyes to observe plants in two different environments (a shady environment and a sunny environment).
3. Discuss how sometimes plants don't change the way they look because they have developed ways (over many years) to survive, however, sometimes plants could respond to or react to their environment (where they live) in a way that changes how they look.

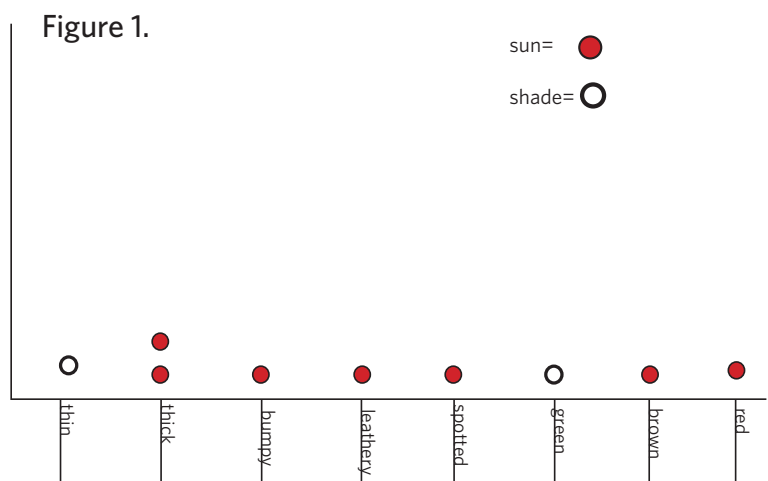
Teacher Tip: Remember, the focus is on the response to the environment rather than adaptation. You can go into adaptation as little as possible if you'd like. This of course will depend on your curriculum and/or grade level.

4. Tell students they will be observing and recording leaf patterns (color and texture) while thinking about the following question: In what way does the sun change the color and texture of a leaf?
5. Explain to students the observations they collect in their data sheets will be used to discuss and observe patterns that relate to how leaves are responding or reacting to where they live.

Activity

1. Have students make a prediction. What do they think they will see in the two different environments or locations.
2. Head outside with groups. Hand out one data sheet per group.
3. Students break up into pairs or small groups and are assigned a plant and location (sun or shade) to become experts on, by looking at the leaves.
4. Ask groups to draw and record their leaf observations on their data sheet. Allow at least 10 minutes for this. Encourage groups to not remove the leaves from their plant (plants are living things too), but rather look and gently touch.
5. Pair up groups from differing environments (for example: shade vs. sun) to share and describe their observations with each other.
6. Reconvene and return to the classroom to collect the data.
7. Have each group present and collect their data by capturing it on the board for all students to see. Check out example below.
8. Collect their drawings to visually observe the patterns of leaf color by hanging them around the room.
9. As each group presents, collect each group's data by plotting it on the board for all students to see. See Figure 1 below as an example.
10. Encourage the class to review the graph of all the leaf observations. Then discuss possible patterns as a group.

Figure 1.



Wrap Up

Discuss the following questions: Use connections as described below to help students make connections as to why they saw what they saw.

- » What do you notice? What do you wonder? What color(s) did we see the most today?
- » What kinds of patterns do we see in the different environments (shade vs. sun)?
- » Do any of the observations today surprise you?
- » Did you notice leaves that had dark spots? Why might this happen? Were these leaves in the sun or shade?

Teacher Tip: *Have students think about what happens to their skin if they get too much sun.*

- » Let's take a look at the data we collected (graph and/or drawings). In what ways were leaves similar and/or different?

CALIFORNIA CONTENT STANDARDS

Kindergarten Life Sciences 2a, 4a, 4b, 4e

Grade One Life Sciences 2a, 4b

Grade Two Life Sciences 2d

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices (K-2)

Planning and Carrying Out Investigations

- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.

Analyzing and Interpreting Data

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world to answer scientific questions.

Disciplinary Core Ideas

2. LS2. A: Plants depend on water and light to grow. (2-LS2-1)

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. (2-LS4-1)

Crocutting Concepts (K-2)

- Patterns in the natural and human world can be observed, used to describe phenomena, and used as evidence.

References

Learning from Leaves: A Look at Leaf Color. The Huntington Library, Art Collections, and Botanic Gardens. Botanical Garden Programs: Reading Plants.

Heat Stress. Susan Jones. American Orchid Society. JULY 2004 issue of *Orchids*: The Bulletin of the American Society.

Plants and the environment. Bay Area Scientists in Schools Presentation Plan. Community Resources for Science.