Great Basin Outdoor School
At-Home Activities for Kids

Leaf Prints or Stained Glass

Lesson Plan

These two activities involve leaves, and thus offer an opportunity for a lot of learning! Leaves are very important for plants because they are specialized for photosynthesis. Photosynthesis is a great example of the interaction between Earth's biosphere (Earth's system that involves all living things) and atmosphere (Earth's system that involves the air and gasses surrounding Earth): it is the process where energy from the sun and molecules from the air are converted into "food" for the plants to use and store. Here, light energy is used to convert atmospheric carbon dioxide into glucose, and this process releases oxygen as a byproduct. This means that leaves are the main way that plants get the energy they need to survive and thrive! And of course, many animals in turn need plants to eat to survive and thrive as well. Since it sucks up CO_2 and releases O_2, photosynthesis is also the reason why trees and plants can aid in climate change mitigation.

Leaves can have many different shapes, sizes, and textures. These differences are called adaptations - each type of leaf evolved in ways to be better suited for their specific environment. For example, broad leaves from deciduous trees (ones that drop their leaves and go dormant in Winter) have more surface area are good for areas with warm, moist summers and tough winters, so that they can get through the winter by using the energy that they stored during the summer. They drop their leaves because all of that surface area can allow moisture to escape, which is not ideal during winter. In contrast, evergreens have long, thin, needle-like leaves covered with a waxy cuticle. Such leaves conserve water in arid or wintry environments, and, together with tree shape, often shed snow. You can see how if these leaves switched climates they might not have the right adaptations to survive. Lastly, the changing of color of deciduous leaves in autumn is triggered by the declining day length and falling temperatures. Because of this, chlorophyll (the green pigment that aids in photosynthesis, within the specialized organelles called chloroplasts, where photosynthesis takes place) begins to degrade. As the green fades, yellow and orange pigments known as carotenoids (that were always there) are revealed in the leaves of many species.

The main ways leaves are classified are by their shape, arrangement about the stem, margin, and venation (examples of each shown in diagrams below). All of these different characteristics are there on purpose – they are each special adaptations that have arisen through many, MANY generations (plants have been around for 470 million years) via natural selection. Natural selection is a process whereby species which have traits that enable them to adapt in an environment survive and reproduce, and then pass on their genes to the next generation. You can see that plants have had a long time to "get it right", and thus many plants today are very specialized and well-adapted to their environment.

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Lesson - Kids

Today we are going to be learning about leaves! Leaves are very important for plants because they are specialized for *photosynthesis*. Photosynthesis is how plants get their food from the sun and the air. They can actually use the sun to change certain molecules from the air (called carbon dioxide) into sugar to eat! While doing this, they also "breathe" oxygen out into the air. Photosynthesis is a great example of the interaction between Earth's biosphere (Earth's system that involves all living things) and atmosphere (Earth's system that involves the air and gasses surrounding Earth). Since photosynthesis happens in leaves, they are the main way that plants get the energy they need to survive and thrive! And of course, many animals need plants to eat to survive and thrive as well.

Leaves can have many different shapes, sizes, and textures. These differences are called *adaptations* - each type of leaf changed over a very long period of time in ways to be able to thrive more in their specific environment. For example, big, wide leaves from *deciduous* trees (ones that drop their leaves in winter) have more space for photosynthesis. This makes them good for areas with warm, moist summers and tough winters (like the northeastern United States). They are able to get tons of food in the summer, store it, and then ditch their leaves in the winter because leaves can allow moisture to escape, and plants want all the water they can get during the winter! Another type of tree, that we have a lot of in the Tahoe area, called *evergreens*, are the opposite. Their needles are actually a type of leaf! The needles are waxy, which allows them to keep water in. They also allow snow to fall off of them easier so their branches don't break from snow piling up (this is also why they have that Christmas tree shape!). You can see how if deciduous and evergreen leaves switched environments they might not have the right adaptations to survive. Lastly, the changing of color of deciduous leaves in autumn is triggered by the days getting shorter and the weather getting colder. These changes make *chlorophyll* (the chemical that makes leaves green, and where photosynthesis happens) begin to break down and die. As the green fades, yellow and orange of the leaves (that are always there, but overpowered by the green) begin to shine through.

The main ways leaves are classified are by their shape, arrangement on the stem, shape of their edges (called the margin), and the way their veins are. Examples of these characteristics are shown below! All of these different characteristics are there on purpose – they are each special adaptations that have arisen through many, MANY generations (plants have been around for 470 million years). This happens through a process called *natural selection*. Natural selection means that the organisms that are better fit for their environment end up having more babies, and pass on these characteristics that make them a better fit. Eventually the whole population will get these better characteristics as the ones who don't have them die out. You can see that plants have had a long time to "get it right", so many plants today fit very well to their environment.

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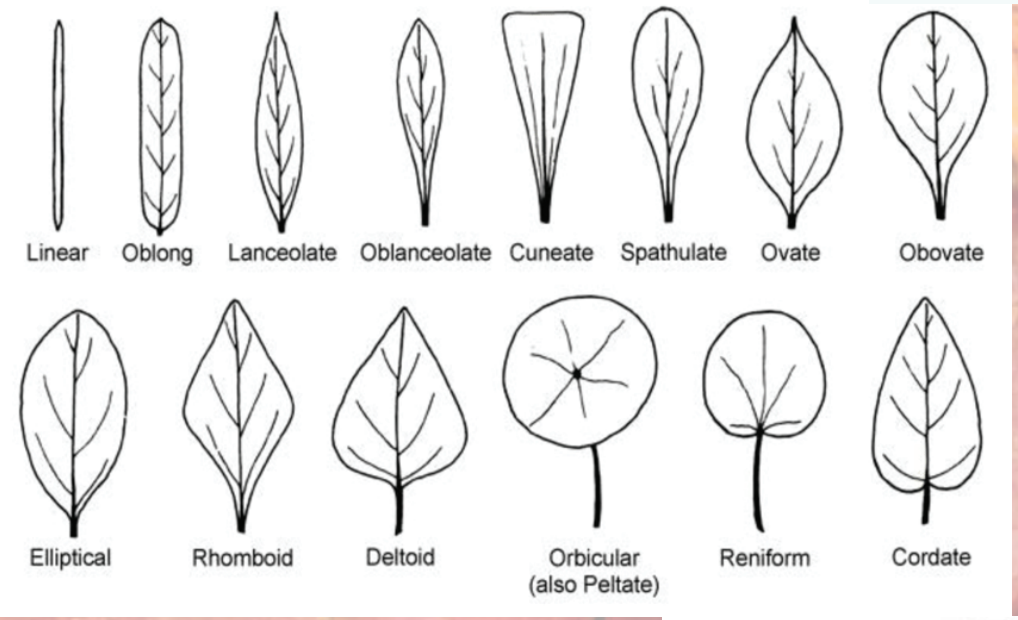
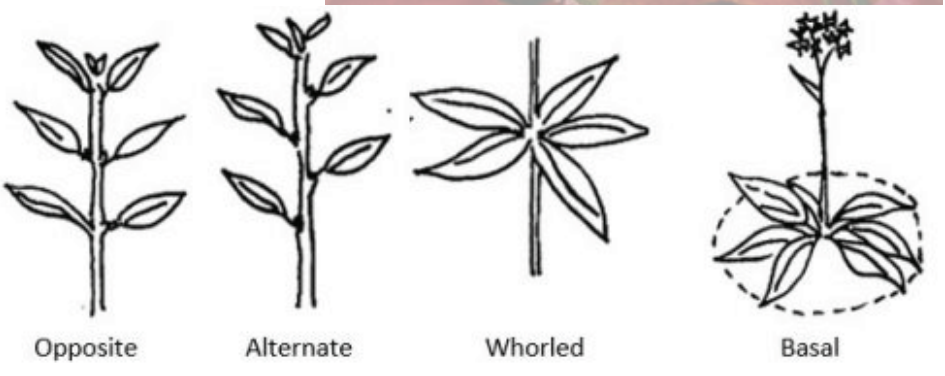
Venation

MARGIN

Shape



Arrangement



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Leaf Prints

Directions

1. Go outside! Have the kids collect leaves and flowers that they like.
2. Discuss the science of leaves, describe their characteristics, and try to identify what types they are if you have a field guide.
3. At home, brush paint on the bottoms of the leaves and carefully place them on the paper.
4. Cover leaf with tissue and smooth it down lightly. Be careful not to move it around.
5. After a few seconds, peel off the leaves.
6. Have them continue decorating the page with the painted leaves however they like!

Materials

Paper
Poster or tempera paints
Paint brush about 1in thick
Tissues
Fresh leaves and/or flowers

Leaf Stained Glass

Directions

1. Go outside! Have the kids collect leaves and flowers that they like.
2. Discuss the science of leaves, describe their characteristics, and try to identify what types they are if you have a field guide.
3. At home, tear off two pieces of parchment paper. Lay one piece on pile of newspaper.
4. Arrange leaves on the waxed paper.
5. Put the second piece of waxed paper on top of the leaves.
6. With iron set on low, gently press the papers, moving in circles until the paper and leaves are all fused.
7. You have your stained glass! Hang it wherever you like.

Materials

Parchment paper
Old newspaper
Iron
Scissors
Fresh leaves and/or flowers

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Relevant Next Generation Science Standards

3rd Grade

3-LS4 Biological Evolution: Unity and Diversity

LS4.B: Natural Selection

Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

LS4.C: Adaptation

For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

4th Grade

4-LS1 From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

5th Grade

5-PS3 Energy

PS3.D: Energy in Chemical Processes and Everyday Life

The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)

5-LS1 From Molecules to Organisms: Structures and Processes

LS1.C: Organization for Matter and Energy Flow in Organisms

Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

5-ESS2 Earth's Systems

ESS2.A: Earth Materials and Systems

Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine

Crosscutting Concepts

Patterns

Cause and Effect

Systems and System Models

Energy and Matter

Scale, Proportion, and Quantity