**Elementary Leave Your Leaves Lesson 3**

*Elementary Lessons designed and created by Katie Henson*

**Comparing Leaves From Different Types of Trees**

**Introduction:** From oak to maple to birch, broad-leaved (also called deciduous) trees go through many changes as seasons pass. In spring, deciduous trees grow leaves and/or flowers. In summer, they display lush green leaves rich in chlorophyll to take in energy from the sun. In fall, their leaves turn hues of yellow, orange, or red as chlorophyll breaks down. In winter, their leaves fall to the ground, no longer directly producing energy from photosynthesis but still benefiting the tree by enriching the soil. However, not every type of tree goes through these annual changes. Commonly found in the same regions as deciduous trees in North Carolina, evergreen (also called coniferous) trees are green year-round. They have their own unique strategy to deal with seasonal change, which is to photosynthesize year-round and produce needles rather than broad leaves. These needles have a much lower surface area than broad leaves, which means that their shape helps conserve water. However, this also means that needles are not as photosynthetic as broad leaves. The large surface area of broad leaves allows for more energy uptake from the sun, making deciduous trees better at photosynthesizing during peak times of the year. In this activity, students will compare leaf types of deciduous and coniferous trees to learn why these types of trees look so different from each other.

**Procedure:** Ask students to choose a location that has a mix of both broad-leaved and evergreen trees. This could be their own backyard, a nearby park, or a nature reserve. At this place, they’ll locate one tree of each type (one broad-leaved and one evergreen) to observe throughout the fall. They should be able to visit these trees 4 times throughout the season, so they should avoid locations that are far away or that may close to the public for hunting season. At the end of fall, students will write and present a one-to-two-page report about the two trees they observed. With appropriate guidance, they’ll use sources like tree identification books or iNaturalist to identify the two tree species. Their reports should include the following: location they chose, species names for both the broad-leaved and evergreen tree, one unique fact about each species, leaf colors of both trees during each observation, temperature and weather during each observation, two T charts with pros and cons of leaves and needles, and answers to the following questions:

1. You may have noticed brown needles on the ground near the evergreen tree. Why do evergreens drop these needles?
2. Both trees live in the same place and face the same conditions during winter. Why do broad-leaved trees lose their leaves during winter, and why do evergreens keep their green needles?
3. Imagine a place that’s very cold year-round with little sun. Would you expect there to be more broad-leaved trees or more evergreen trees, and why?
4. Tropical places don’t have seasons like we do, and are sunny and warm year-round. How would you expect broad-leaved trees in the tropics to be different from broad-leaved trees in North Carolina? Would you expect tropical trees to lose their leaves some time during the year?

Presentations in front of the class will be short, 5 minute summaries about their reports. Students will share the species they observed, the fact they wrote for each species, and some things they found surprising during their observations. Visual aids are encouraged—examples include photos or drawings of their trees, a poster with the T charts from their report, or a few fallen leaves from each tree to pass around while they present.

**EXAMPLE REPORT**

Location: The trees I observed are located on Duke’s campus in Durham. The location was near a parking lot, and there was an even mix of broad-leaved and evergreen trees.

Species names: The broad-leaved tree I observed is called the Willow Oak. The evergreen tree I observed is called the Loblolly Pine.

Species facts: Willow Oaks produce acorns that deer and squirrels like to eat. Loblolly Pines are the second most common tree in the U.S.

Observations:

9/28: The Willow Oak has green leaves, and the Loblolly Pine has green needles. The temperature is 76 degrees and the weather is sunny.

10/13: The Willow Oak leaves are starting to turn yellow but are still mostly green, and the Loblolly Pine still has green needles. The temperature is 68 degrees and the weather is partly cloudy.

11/03: The Willow Oak leaves are all orange, and some are now on the ground. The Loblolly Pine has green needles, but there are brown needles on the ground. The temperature is 57 degrees and the weather is rainy.

12/14: The Willow Oak leaves are brown, and most leaves are on the ground. The Loblolly Pine still has green needles, but more brown needles are on the ground. The temperature is 42 degrees and the sky is cloudy.

 Broad leaves Needles

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| --- | --- |
| Can photosynthesize all year | Have to spend energy on needles all year |
| Small leaf surface area saves water | Small surface area bad for photosynthesis |
| Don’t have to spend energy replacing needles | Dead needles don’t enrich soil as much as leaves do |
| Not many animals eat pine needles | Can’t increase photosynthesis in sunny seasons |

 Pros Cons Pros Cons

|  |  |
| --- | --- |
| Only spend energy on leaves when sun is out the most | Takes energy to make and grow new leaves each year |
| Large leaf surface area helps absorb more sunlight | Can’t photosynthesize in winter |
| Can drop leaves to save energy in winter | Lose water by keeping leaves alive |
| Dead leaves enrich the soil near the tree | Leaves can be eaten by animals |

 Questions:

1. Evergreen needles can become old or damaged, so they get replaced all year.
2. Broad-leaved trees lose their leaves in the winter to save water. Also, there is less sunlight in winter, so leaves don’t help much anyway. Evergreens keep needles because they don’t lose water through them and they can be used to produce energy with limited sunlight.
3. A cold place with little sun would have more evergreen trees. Evergreen trees can photosynthesize in cold weather with little sunlight. Broad-leaved trees do most of their photosynthesis during sunny seasons, and their leaves would be a waste of water and energy if sunlight was low all year.
4. In the tropics, trees would not need to lose their leaves because it’s sunny all year. The leaves can stay green all year to absorb the plentiful sunlight, and there would be no reason for leaves to fall because the warmth and sunlight provide a constant source of energy.