Leaf Change/ Chromatology and Photosynthesis Hike

K-8 Grades

Purpose:

- Students will summarize how plants use photosynthesis to make food
- Students will understand how biochemical reactions are revealed during leaf change

Objectives:

Students will be able to explain the photosynthesis equation

Students will identify 4 structures of plants and their functions as they relate to the survival of plants

Students will identify leaves and plant materials as evidence of season change

Hours: 30 Minutes

Instructional Method: Field Study

Materials: Photosynthesis equation cardboard posters, chromatology plexiglass display, large cardboard cut out leaves

Curriculum Correlations

K.E.1.2, K.E.1.3, 2.E.1.3, 3.L.2.3

4.L.1.1, 4.P.3.1, 5.E.1.1, 5.L.2.3, 6.L.1.1, 6.L.1.2, 6.L.2.1, 6.L.2.2, 8.P.1.3, 8.L.3.3

Key Terms:

Life Cycle, Roots, Stems, Leaves, Flowers, Growth, Sugar, Photoperiod, Photosynthesis, Interconnected Relationship, Environmental Conditions and Survival

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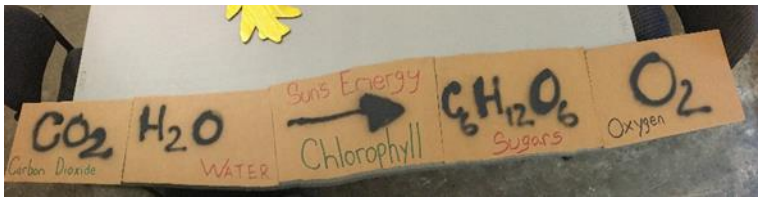
Background

Organisms such as trees respond to a changing environment, for a tree in the autumn this means dropping delicate leaves, storing nutrients for the winter and slowing the flow of water through the stem and roots. Dropping leaves provides an advantage for deciduous trees for survival through the harsh winter. Trees derive their energy by making their own food through the process of photosynthesis.

Photosynthesis is the process which allows plants to collect energy from the sun and make sugars/food. Tree leaves collect or reflect the lights rays during the growing season for this process. In the fall, as the photoperiod is reduced and as night periods grow, tree and plants are triggered to make changes to prepare for seasonal winter changes. If the leaves stayed connected to the tree it would cause stress, and be susceptible to freeze due to the water trapped in the leaf.

Leaf color is impacted by night and day time temperatures, warm periods, tree species, elevation and wind events. Studying how photosynthesis works, helps us understand the biochemistry of leaf color change.

Props



Development

Light as an **Energy Source** is a basic form of energy like sound, heat, electrical, and magnetic. Each can cause motion or create change. Light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed. Photosynthesis is an example of absorbed light.

Photosynthesis=

$6CO_2 + 6H_2O$ ------> $C_6H_{12}O_6 + 6O_2$ (Carbon + water and sun's energy = glucose, oxygen)

Chlorophyll - a green pigment, present in all green plants, responsible for the absorption of light to provide energy for photosynthesis. Chlorophyll reflects green light and absorbs the wavelengths of light that have more energy including blue indigo and violet. These mask the below chemicals during the growing season. When Chlorophyll begins to deteriorate, the other chemicals are revealed.

Carotenoids are the yellows and oranges in nature responsible for coloring oranges, bananas, etc. they are hiding under the green film, and help in photosynthesis to absorb green since chlorophyll can't.

Anthocyanins, are produced later in the season when water and sugar become trapped in the leaf during warm bright fall days. They are responsible for the purples and crimson colors not associated with leaf species, and the colors in nature of (cranberries, red apples, concord grapes, blueberries, cherries, strawberries, and plums)

Xanthophylls- Yellows, oaks, display mostly browns. All these colors are due to the mixing of varying amounts of the chlorophyll residue and other pigments in the leaf during the fall season.

Trees build a corky barrier between the leaf and the branch, which becomes totally blocked when all nutrients are absorbed back into tree. Anything trapped in the leaf after absorption contributes to brilliant colors in leaves such as purples **Anthocyanins** .

Additional Procedures: Walk students on trail ask them to observe any signs they see of feel of changing seasons. Have them share examples. Pick up examples of acorn, changing leaf, etc. Find spot on trail to explain the above material, review and conclude.

Conclusion

Trees use their leaves as a kitchen during the spring and summer. The kitchens collect sunlight and transform it into glucose and oxygen during the process of photosynthesis. Shorter light periods trigger the change in leaf color, the stems of leaves begin to pull all water and nutrients in the leaves back to the tree stem for the period of dormancy. In the process of pulling resources from leaves, chlorophyll deteriorates and reveals other colors always present including carotenoids and Anthocyanins, which also help collect wavelengths of light the greens reflect. Trees will regrow leaves again in the spring. Show the equation of Photosynthesis to students and explain how the deterioration of chlorophyll helps us see the other colors that were always present in the leaf. Remind students this process of biochemistry explains the reason we see leaves of various colors in the fall. Walk students back to the meeting location after answering any additional questions.

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Technology Connections

Fall Color Guy (Appalachian State University)

Extension

Have students observe leaf change during a few week time period to graph color changes, according to the examples from Fall Color Guy. Nature Journaling opportunity, leaf rubbing, or write a short story.

Evaluation

Brevard Elementary School participated Fall 2017 at DSRF.