

Workshop 5:

Sunlight to Starch

DESCRIPTION

In this program participants will explore how plants get their food. Starting with seeds, which have their own source of food, the program traces the growth of a plant, the development of chlorophyll in its leaves, and the production of sugar (and starch) in a process known as photosynthesis.

Chlorophyll-containing organisms are able to absorb photons of light energy and use their energy to join carbon dioxide with hydrogen from water. As a result of a whole series of intermediate reactions sugar is made. Light energy is therefore transformed into chemical energy contained within sugar. As a by-product, oxygen is released into the atmosphere.

Sugar is used as the building block for plants. It is transported to all parts of the plant and used to make components of the cell as well as to provide the energy to drive the processes occurring in cells. When plentiful, sugar is converted to starch and stored.

Carbon dioxide is the main ingredient of sugar and consequently this gas is responsible for making the greatest contribution to the dry mass of a plant, be it the smallest daisy or the tallest tree. When asked where a plant gets its food, children will often answer that it comes from the soil. Even after instruction in photosynthesis, it is hard for students to believe that a gas can be the source of the stuff (matter) of which plants (including trees!) are made.

Not only is photosynthesis essential for the plant's growth, it is essential for maintaining life on Earth. Without plants, there would be an abundance of carbon dioxide in our atmosphere which would contribute to global warming. Additionally, the release of oxygen into the Earth's atmosphere during photosynthesis provided the conditions for evolution of a multitude of life forms.

LEARNING OBJECTIVES

Participants will gain:

- An understanding of the process of photosynthesis, namely that chlorophyll in green plants absorbs light energy to combine carbon dioxide and water to make sugar and oxygen.
- A recognition that light energy is absorbed and transformed into chemical energy within sugar.

Workshop 5 timeline

GETTING READY

30 minutes

Plants and Light

Think about what you have learned about the properties of light as you discuss the following questions with your group:

- Do you need light to see? What evidence do children have for this?
- Why do the leaves of most plants look green?
- Why might a florist shine a green spotlight on plants that are on display?
- Plants use the energy of visible light. Which photons of visible light do you think they use? Give the reasons for your answer.

Using your prior knowledge and observations of the world around you, make a list of the ways in which you think parts of the plant might interact with light.

Part of Plant	Do you think that this part interacts with (responds to) light? (YES / NO)	If you answered YES in column 2, explain how this part of the plant interacts with light.
*Seed		
Flower buds		
*Growing shoot		
Root		
*Leaves		

*Listen and watch for these interactions during the workshop

Workshop 5 timeline

GOING FURTHER

30 minutes

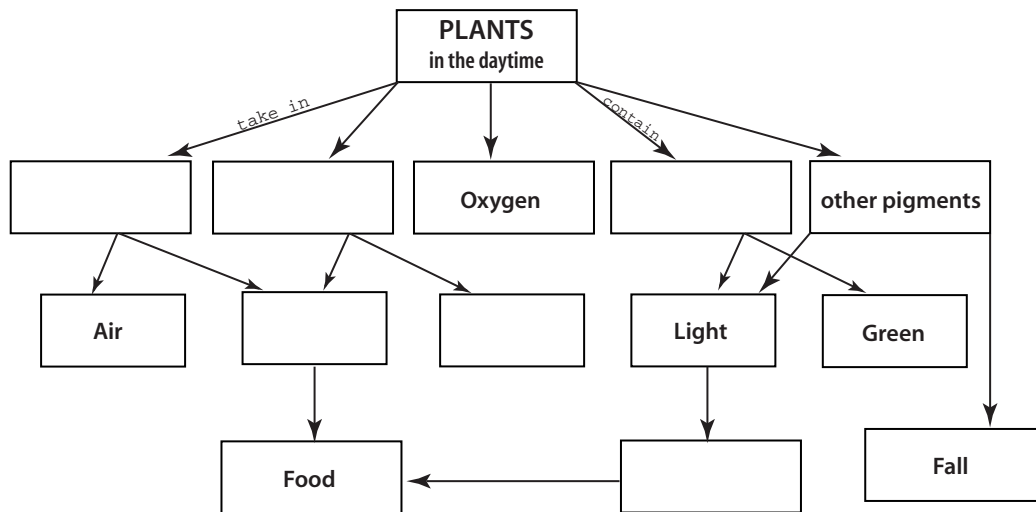
Concept Mapping

In Workshop 5 you have explored the interactions between plants and light. The “fill-in” concept map below can be used to link some of the concepts discussed.

Using the concepts from the list, fill in the map to show the connections between concepts. Use brief linking words on every arrow to explain how the concepts are connected. You might want to fill in the map individually at first and then compare maps with your partner and with the rest of the group.

(A few examples are completed for you).

Concept Map list: Carbon dioxide, Sugar, Soil, Chlorophyll, Energy, Water



For next time

HOMEWORK ASSIGNMENT

Greenhouse Effect

One environmental issue facing life on earth is that if we destroy the rain forests there may be a significant rise in the level of carbon dioxide in the atmosphere.

Use the web or any other resources available to you to find out what the normal percentages of gases are in our atmosphere and then think about the following question.

- Why might the carbon dioxide level rise if there is mass destruction of rain forests?

Carbon dioxide is one of the main gases which contribute to the 'Greenhouse Effect'. Use the web or any other resources to find out what the greenhouse effect is and then think about the following questions.

- How does carbon dioxide contribute to this effect?
- Why is the Greenhouse Effect a cause for concern?

A second environmental issue facing life on Earth is the hole in the ozone layer. Ozone is a layer of gas in our atmosphere that protects us from ultraviolet photons.

- What might be the effects to life on Earth caused by this thinning of the ozone layer?

Web Links to Accompany Homework for Workshop 5

Greenhouse Effect

<http://www.nafi.com.au/faq/greenhouse.html>

<http://www.northnet.org/earth/greenhs.htm>

<http://royal.okanagan.bc.ca/mpidwirn/atmosphereandclimate/greenhouse.html>

Atmosphere

<http://liftoff.msfc.nasa.gov/academy/space/atmosphere.html>

Standards

National Science Education Standards

K-4 Standards: <http://bob.nap.edu/html/nses/html/6c.html#csc4>

Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.

Content Standards: K-4: Life Science: The Characteristics of Organisms

K-4 Standards: <http://bob.nap.edu/html/nses/html/6c.html#csgk4>

Although men and women using scientific inquiry have learned much about objects, events, and phenomena in nature, much more remains to be understood. Science will never be finished.

Content Standards: K-4: History and Nature of Science: Science as a Human Endeavor

5-8 Standards: <http://bob.nap.edu/html/nses/html/6d.html#csc58>

For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

Content Standards: 5-8: Life Science: Population and Ecosystems

5-8 Standards: <http://bob.nap.edu/html/nses/html/6d.html#csg58>

Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models.

Content Standards: 5-8: History and Nature of Science: Nature of Science

Related Sources

Burnie, D. (1989). *Plant*. Eyewitness Books. New York: Alfred A. Knopf, Inc.

Gralla, P. (1994). *How the environment works*. CA: Ziff-Davis Press

Hoagland, M., & Dodson, B. (1995). *The way life works*. NY: Times Books, Random House.

Nye, B., & Saunders, I. (1995). *Bill Nye the Science Guy's Consider the Following*. NY: Disney Press.

Porritt, J. (1991). *Save the earth*. GA: Turner Publishing Inc. (A Dorling Kindersley Book)

<http://mss.scbe.on.ca/DSPHOTOS.HTM>
A site full of links about photosynthesis