Plant Parts – Leaves and Photosynthesis

Lesson Description

In this lesson, students are introduced to the process of photosynthesis. Students review the life cycle of a plant and learn how plants make their own food to survive. Students conduct an experiment to see the rainbow of colors present within leaves and understand the role of leaves in photosynthesis.

- Time required: 60 minutes
- Location of lesson: Classroom

Learning Objectives

- Describe the process of photosynthesis.
- Understand the function of leaves in the process of photosynthesis.
- Identify pigments in the leaves of plants.
- Recall the three things that plants need to survive.

Materials and Preparation

- Leaves in at least 3 colors (such as purple cabbage, red leaf lettuce, spinach, green leaf lettuce, or Maple leaves or other leaves that change color in the fall), prepared so there are 2 individual leaves per student
- White coffee filters cut into strips 1 inch wide; 1 per group of 2-3 students
- Coins; 1 per group of 2-3 students
- Rubbing alcohol
- Mason jars; 1 per group of 2-3 students
- Pencil or pen; 1 per group of 2-3 students
- Tape; 1 per group of 2-3 students
- Foil pieces to cover jar; 1 per group of 2-3 students
- Projector to show the slides
- Try the chlorophyll experiment before the class so you know how to demonstrate the activity
- **Photosynthesis PowerPoint**
- **The Life Cycle of a Plant**
- **Photosynthesis**
- **Chlorophyll Experiment**
- Prepared vegetable snack of the week – 1 for each student
- Water to drink during the Class Warm-up – water dispenser in the classroom and 1 cup or a water bottle for each student

Class Warm-up: Champion Cheer and Veggie Taste Test (5-10 minutes)

- Give each student a cup of water or ensure that they have a filled water bottle in front of them.
- Give each student the prepared veggie snack of the day.
- Lead the students in enthusiastically reciting the 📖 **Champion Cheer**.
- At the end of the cheer, drink water and eat the veggie snack together.
- Have students complete their 📖 **Taste Test Observations** about the vegetable snack of the week.

Review of Last Lesson (2-3 minutes)

- Review the evaluation questions from last week's lesson. Evaluation questions from all lessons are listed at the end of the workbook 📖.

Class Discussion: The Life Cycle of a Plant (10 minutes)

- Begin with a Riddle
    - *Today I have a riddle for you. See if you can guess what I am talking about.*
        - *What group of living things:*
            - *Often stays in one place for life but may send their children on journeys of thousands of miles;*
            - *Can be as small as the smallest living thing on Earth, and yet can also be the largest;*
            - *Gives new life when they die;*
            - *Feeds nearly every animal on Earth;*
            - *May be as soft as mush or harder than some rocks;*
            - *Can survive in the ocean, Arctic, or desert environments;*
            - *Moves, but appear to be still; and*
            - *Is usually green, but can be any color of the rainbow?"*
                - *The answer is: PLANTS!!*

What do we mean when we say 'life cycle' or 'circle of life'? What do you remember about the life cycle of a plant? Let's read a story about that now.

Refer students to the 📖 **The Life Cycle of a Plant** pages in the workbook. Read aloud through the text and highlight the pictures and diagrams. Have students follow along.

The story we just read tells us that the life cycle of a plant starts from a seed and continues through the plant's growth until the plant starts to die. Any seeds that the plant produces can be planted or stored for later use, so the plant's life cycle repeats itself over and over again.

In the story, we also talked about the plant making food. This is called photosynthesis.

Write the word 'photosynthesis' on the board.

Let's say that word together: photosynthesis.

Do plants have mouths? (Answer: No!) *So how do plants eat? They eat through the process of photosynthesis. The leaves on a plant are very important in this process. The green color in the leaves makes photosynthesis possible.*

The green color in leaves is called chlorophyll. Write the word 'chlorophyll' on the board. *Let's say that word together: chlorophyll.*

We are going to do an experiment now to learn more about photosynthesis and the chlorophyll in leaves.

Activity (15 minutes)

- 📖 **Chlorophyll Experiment Part 1 (15 minutes)**
    1. *Today we are plant scientists. What is a plant scientist called?* (Answer: botanist)
    2. *We are going to study the leaves of a plant and see the rainbow of colors in the leaves. Leaves have a green pigment called chlorophyll that they use to capture sunlight. Leaves also have pigments of other colors to capture colors of light that chlorophyll misses. That's what we will explore in this experiment.*
    3. Divide the class into groups of 2-3 students. Distribute supplies to each group: 3-6 colored leaves, white coffee filter strip, a coin, a jar, tape, pen or pencil, foil piece to cover jar.
        - Note – the teacher should hold the rubbing alcohol bottle and fill each group's jar during step c. below.
    4. Refer students to the 📖 **Chlorophyll Experiment** pages in the workbook so they can follow along with the instructions:
        a. *Place a leaf on the filter ½ inch above the bottom. Roll the edge of a coin over the leaf a few times, pressing leaf juice into the paper. The leaf juice should be about a ¼ inch wide band of color across the coffee filter strip. Look at the example in the workbook to see how this should look.*
        b. *Let the filter strip dry. Repeat the process with three different colored leaves.*
        c. *Pour a ½ inch of rubbing alcohol into the jar.*
        d. *Tape the paper strip to the middle of a pen or pencil and hang it so the very tip of the strip touches the alcohol. (The colored stripe of leave juices should not touch the alcohol – you may have to adjust the length of the strip). Look at the example in the workbook to see how this should look.*
        e. *Put a piece of foil over the top of the jar to keep alcohol from evaporating.*
        f. *Watch carefully as the alcohol moves up the filter paper, carrying the pigments along with it. In 10-20 minutes the colors should be separated - do not allow them to run to the top of the paper.*
    5. Before the alcohol starts moving up the filter paper, instruct students to write down in the workbook (# 1) their hypothesis about what will happen to the coffee filter.

Class Discussion: Photosynthesis (20 minutes)

While waiting for the experiment to conclude, discuss photosynthesis. First show the **Photosynthesis PowerPoint** slides.

Cover additional talking points:

Photosynthesis may sound like a big word, but it's actually pretty simple. You can divide it into two parts: "photo" is the Greek word for "light," and "synthesis" is the Greek word for "putting together," which explains what photosynthesis is. It is using light to put things together. The plant is using sunlight to make food. Do our bodies make food? (Answer: No!) *You may have noticed that all animals and humans eat food, but plants don't eat anything. Eating food is how we get energy for our bodies, but do plants have mouths to eat food?* (Answer: No!) *Photosynthesis is how plants eat. They use this process to make their own food and get energy to grow. They can make their food anywhere as long as they have 3 things:*

- *Carbon Dioxide*
- *Water*
- *Light*

You have probably heard of carbon dioxide. It is a chemical that is in the air. Every time you breathe in, you breathe in a bunch of chemicals in the air, including oxygen and carbon dioxide.

Here's what photosynthesis looks like:

- *Carbon Dioxide + Water + Light → Sugar + Oxygen*

Plants breathe, just like us. They even have little openings that can look like mouths, but they are too small for us to see without a microscope. When we breathe in, we want to breathe in Oxygen. Plants want to breathe in Carbon Dioxide. If you put a plant in a Ziploc bag and sealed it, that plant wouldn't last very long. Plants also drink. This is why you need to water plants or they will die. They use their roots to suck water up into their bodies, and they use their little mouths to breath in the Carbon Dioxide. Once they have both of these things, all they need is light. (Remember when we were talking about our bodies and the 3 basic things we need? Air, water, and food? Plants are just like us! Only to them, the sun is like their food.)

Leaves are made up of a bunch of tiny cells. This is where photosynthesis happens. Inside the cells are tiny little things called chloroplasts. Chlorophyll is a pigment that gives chloroplast its green color (that's what the experiment is showing us!). Chloroplasts absorb sunlight and transfer the sunlight into energy.

The energy later turns into sugar. The sugar is then used by the plants for food, and the oxygen is breathed out into the atmosphere. This process as a whole is "photosynthesis." Without photosynthesis, plants wouldn't exist.

Refer students to the 🕮 **Photosynthesis** worksheet in their workbooks. Fill in the answers as a class. Refer to the 🕮 **Photosynthesis** worksheet in the workbook answer key for the answers.

Activity (5 minutes)

- 🕮 **Chlorophyll Experiment Part 2 (5 minutes)**
    1. Return to the experiment and look at the results.
    2. *How many colors do you see?*
    3. *Could you see them in the leaf itself, before the experiment?*
    4. Instruct students to return to their workbook 🕮 **Chlorophyll Experiment** page and explain the results (# 2).

Evaluation Questions (5 minutes)

1. *What does germinate mean? (*Answer: when a seed starts to sprout)
2. *What is the green pigment in plants called?* (Answer: chlorophyll)
3. *What do we call the way that plants make food?* (Answer: photosynthesis)
4. *What three things do plants need to survive?* (Answer: carbon dioxide, water, light)
5. *Plants make a gas that humans breathe in, what is it called?* (Answer: oxygen)
6. *How much water should you drink every day?* (Answer: at least 6 cups of water a day)
7. *How many fruits and vegetables should you eat every day?* (Answer: at least 5 fruits and vegetables a day)
8. *Does gardening connect you to your culture and help you learn new words in your language?* (Answer: yes)

Preparation for Future Lessons – Reminder for the Instructor

- Review the materials and preparation needed for the next lesson.
- Remember that an Elder guest instructor is needed for these Fall lessons: Lesson 2 (The Plant Life Cycle), Lesson 4 (Seed Saving), Lesson 6 (Drying Foods the Traditional Way) and Lesson 10 (Companion Planting and Traditional Cooking).

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