Grade Level: 3-5
Time Estimate: 1-2 days

PHOTOSYNTHESIS / INSTRUCTOR INFO

Summary

This lesson includes vocabulary, content, and creative activities to help students learn about the process of photosynthesis in plants. Students will learn about what plants need in order to grow and survive. To demonstrate their new knowledge (and acting skills!) students will perform a short 5-minutes skit about photosynthesis.

Part 1. Introduction
Part 2. What is Photosynthesis?
Part 3. Why is it Important?
Part 4. Alternative Food and Adaptations
Activity 1. Photosynthesis Skits

Goals & Objectives

The students will:

- Learn what photosynthesis is;
- Learn what a plant needs in order to grow and survive;
- Learn different adaptations that plants have;
- Learn why plants are so important to us and the role they play on Earth;
- Learn how some plants do not strictly rely on just photosynthesis for food.

// STANDARDS

This lesson aligns with the following TEKS:
Grade 3 Science: 1A, 2A, 2C, 2D, 2F, 4A, 9A, 10A
Grade 4 Science: 1A, 2A, 2B, 2C, 2D, 2F, 4A, 9A, 9B, 10A
Grade 5 Science: 1A, 2B, 2C, 2D, 2F, 2G, 3A, 4A, 9A, 9B, 9D

This lesson aligns with the following Next Generation Science Standards:

From Molecules to Organisms: Structures and Processes – 5-LS1-1

Science and Engineering Practice
Engaging in Argument from Evidence
• Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). (5-LS1-1)

Disciplinary Core Ideas
LS1.C: Organization for Matter and Energy Flow in Organisms
• Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

Crosscutting Concepts
Energy and Matter
• Matter is transported into, out of, and within systems. (5-LS1-1)

STEM
This lesson plan aims to assist teachers in implementing a STEM-based program into their classroom while inspiring the next generation of explorers, scientists, and stewards of the ocean. Based on real science and the Global Shark Tracker™, this lesson is intended to promote environmental awareness and to prepare students for STEM careers.

Helpful Tips

1. The content in this lesson is related to OCEARCH and the Global Shark Tracker. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker is also available as an app for iPhone and Android.
2. This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
3. Vocabulary words will be underlined as they appear in the lesson plan. A complete list of vocabulary words is included as well.
4. Answers to questions and prompts for discussions will appear in italics.
5. Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
6. Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
7. Email all questions about this lesson to info@OCEARCH.org.

Grade Level: 3-5

PHOTOSYNTHESIS / VOCABULARY

Absorb - To take in or soak up.

Adaptation - A characteristic that helps an organism survive in their environment.

Atmosphere - The layer of gasses that surrounds the Earth.

Boggy - Too wet and muddy to be easily walked on; marshy.

Carnivorous - Describes an organism that feeds on other organisms to survive.

Cell - The smallest structural unit of an organism.

Chloroplasts - A plastid where photosynthesis takes place.

Emergent Layer - The top layer in the rainforest.

Endangered - An organism that is at risk of going extinct.

Evolve – To develop gradually from a simple form to a more complex form.

Fertilizer - A natural substance or chemical that is added to soil to increase the nutrients for a plant.

Greenhouse - A glass building where plants that need protection from cold weather are grown.

Nourishment - The food or other substances necessary for growth, health, and good condition.

Nutrients - Component in foods that an organism uses to survive and grow.

Organism - A plant, animal, or single celled life form.

Photosynthesis - The process by which plants use the energy from sunlight to produce sugar, which cellular respiration converts into energy.

Primary Producers - Organisms in an ecosystem that produce their own food.

Root - A part of a plant that attaches to the ground and provides support and stability to the plant.

Secrete - To produce and discharge a substance.

Stem - The main stalk of a plant that is typically above the ground.

Stoma – A tiny pore or opening on the leaf of a plant that is used for gas exchange.

Grade Level: 3-5
Time Estimate: 5-15 mins

PHOTOSYNTHESIS / PRE-LESSON ASSESSMENT

Use the following true/false and multiple-choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1. True or False
All plants get their food through photosynthesis.
Answer: False

2. True or False
Humans would be able to survive without plants.
Answer: False

3. What does a plant need in order to grow?
- **a.** Light
- **b.** Water
- **c.** Carbon Dioxide
- **d.** All of the above

Answer: d

4. What does "photo" mean in Greek?
- **a.** Dark
- **b.** Picture
- **c.** Light
- **d.** Camera

Answer: c

5. Plants release _____ as a byproduct of photosynthesis.
- ***a.*** Carbon dioxide
- **b.** Oxygen
- **c.** Nitrogen
- **d.** None of the above

Answer: b

Name: _____

Date: _____

PHOTOSYNTHESIS

Select the correct answer(s) to each of the following questions.

1) True or False

All plants get their food through photosynthesis.

2) True or False

Humans would be able to survive without plants.

3) What does a plant need in order to grow?

a. Light

b. Water

c. Carbon dioxide

d. All of the above

4) What does "photo" mean in Greek?

a. Dark

b. Picture

c. Light

d. Camera

5) Plants release_____ as a byproduct of photosynthesis.

a. Carbon dioxide

b. Oxygen

c. Nitrogen

d. None of the above

Grade Level: 3-5

PHOTOSYNTHESIS / LESSON PLAN

PART 1. INTRODUCTION **3-5 mins**

Plants play a very important role on Earth and fulfill this role by making their own food. All living things need nourishment so that they can grow and be healthy. Some organisms hunt other organisms and consume them for nourishment, while others produce their own food. Organisms that produce their own food are called primary producers. Plants are primary producers that produce their own food through a process called photosynthesis.

PART 2. WHAT IS PHOTOSYNTHESIS? **5-10 mins**

If we break up the word "photosynthesis" into "photo" and "synthesis" we can better understand its meaning. "Photo" in Greek means "light". "Synthesis" in Greek means "to put together". Therefore, photosynthesis means using light to put things together. In photosynthesis, plants use light to combine water and carbon dioxide (a gas found in the atmosphere) to make sugar and oxygen.

The Process of Photosynthesis

Plants have stomata on their leaves which are tiny pores or openings that are used for gas exchange. When plants open their stomata, they release oxygen (a byproduct of photosynthesis) and absorb carbon dioxide. At the same time, plants absorb water through their roots. The water is transported through the stem to the plant's leaves. The leaves are made up of tiny cells that contain chloroplasts. Chloroplasts are what make a plant green and where photosynthesis occurs. Here in the chloroplast is where water, carbon dioxide, and light combine to make sugar and oxygen. The sugar is used as food and the oxygen is released as a byproduct into the atmosphere.

Plants can't survive on photosynthesis alone. They also need nutrients from the soil to help them grow and survive. This is why many people use fertilizer the help their plants grow. Fertilizer contains extra nutrients that can help the plant grow.

PART 3. WHY IS IT IMPORTANT? **5-10 mins**

Humans need oxygen in order to survive. We breathe in oxygen in a process called respiration. And lucky for us, oxygen is a byproduct of photosynthesis, so there's plenty of it in the air. The byproduct of respiration is carbon dioxide. So when we exhale, we provide plants with more carbon dioxide. However, even though we provide plants with carbon dioxide they do not need to rely on us because there is already enough carbon dioxide in the air for them to survive. However there is not enough oxygen in the air without plants and therefore we need them in order to survive. In fact, it wasn't until plants evolved to use photosynthesis that the atmosphere had any oxygen at all! (Fun Fact: The majority of the oxygen that we breathe actually comes from marine plants!)

PART 4. ALTERNATIVE FOOD AND ADAPTATIONS **10-15 mins**

Alternative Food Sources

Almost all plants get their food using only photosynthesis. However there are a few species of carnivorous plants that get their food by consuming animals!

Figure 1. Venus Flytrap, *Dionaea muscipula*
Photo Credit: Sarah Rich - Landry's Downtown Aquarium Houston

The Venus flytrap is a fascinating plant that can get nutrients either through photosynthesis or by digesting small insects. These plants are native to boggy areas of North and South Carolina, but due to people's fascination many of them were collected and populations were almost endangered. Venus flytraps are now grown in greenhouses and sold to interested plant owners. Venus flytraps capture insects that crawl or fly onto the hairs of the trap. The lobes of the trap can shut in less than a second. The Venus flytrap then secretes digestive juices to breakdown and digest the insect.

Adaptations

You might have noticed that some plants have large leaves while others have small leaves. This is an adaptation that plants have to help them absorb the proper amount of sunlight that they need. If a plant gets too much sunlight or too little sunlight the plant will die. The size of the leaves is dependent on the location of the plant and how much sunlight the plant will receive. In the tropical rainforest, leaves of plants at the bottom on the forest floor are quite large because there is not a lot of sunlight that reaches the forest floor. Leaves at the very top of the rain forest in the emergent layer are small because they are not blocked of sunlight. Therefore, they receive more sunlight than the leaves on the forest floor.

Grade Level: 3-5
Time Estimate: 20-30 mins

PHOTOSYNTHESIS
ACTIVITY 1. PHOTOSYNTHESIS SKITS

INTRODUCTION

Students should now have a basic understanding of what photosynthesis is, the process, and its importance. To demonstrate this understanding, students will perform a short 5-minutes skit about photosynthesis. Skits can be funny, dramatic, or imaginative as long as they address the main points listed below!

INSTRUCTIONS

1. Divide the class into groups of seven students to play the parts of: the Sun, a plant, water, carbon dioxide, oxygen, sugar, and the narrator (can have multiple narrators or include a director/group leader if groups need to be larger than seven students).

2. Allow students 30 minutes to prepare and practice their skit. If you have more time available, allow the students to make costumes and props. If time does not allow for costumes and props, students should at least create large "nametags" using construction paper, markers, a hole puncher, and yarn.

The skits should:

- Define "photosynthesis".

- Describe the process of photosynthesis.

- List what a plant requires for photosynthesis (water, light, carbon dioxide).

- Include vocabulary such as absorb, nutrients, energy, etc.

- Describe the importance of photosynthesis.

- Optional: What happens to a plant if it cannot photosynthesize for some reason (not enough light or no water).

3. Students will perform their skits for the whole class. For more fun, perform the skits outside!