

# I'm Hungry! The Photosynthesis Picture

Discover how your school garden plants make their own food

## Gardening Connection:

The school garden is a wonderful outdoor classroom to teach basic plant biology.

## Time Required:

2 class periods

## Grade Level:

Elementary to Middle School

## EDUCATOR NOTE:

## OBJECTIVES

Students will be able to:

1. List what resources are needed for photosynthesis to occur
2. Document observations from investigations and explain basic photosynthesis
3. Identify three healthy green plants

## BACKGROUND

Green plants are unique in that they are able to make their own food. Photosynthesis is the process through which the sun, water, and carbon dioxide are absorbed by the plant and turned into sugars (or food) for the plant. Another product of photosynthesis is oxygen.

Plants absorb water and minerals through their roots. They absorb CO<sub>2</sub> (carbon dioxide) and the sun's energy through their leaves.

Chlorophyll in the leaves absorbs the sun's energy and transfers it into energy the plant can use. Chlorophyll is also what causes leaves to be green. Plants of other colors also conduct photosynthesis (like trees with red or purple leaves). In these plants the chlorophyll is present, but is masked by other colors in the leaves.

Without chlorophyll, photosynthesis could not take place and plants would not be able to create their own food!

Chlorophyll is also an important part of human diets. Green vegetables provide humans with chlorophyll.

## MATERIALS

- Plant-based snacks (optional)
- Potted plants

## Subjects

Biology / Botany  
Math

## Vocabulary

Chlorophyll  
Photosynthesis

## Project Connections

WET - Thirsty Plants  
PLT - How Plants Grow  
Sunlight and Shade  
Air Plants

## **PROCEDURES**

### **Engage**

Provide a plant-based snack for the class. As everyone is eating, ask how many students ate breakfast that day. Ask them if they made their own breakfasts.

Some students may say yes, others may say that a parent or other caregiver made it.

Challenge the idea that they had truly MADE this food. State that they prepared it to be eaten, but the only things that can actually make their own food are plants.

### **Explore**

Ask students if they have heard the term “photosynthesis.” Allow several students to share their definitions of this word.

Expand on these definitions to build a working definition for the class. Emphasize how important it is that plants can create their own food.

Review that plants need water, CO<sub>2</sub> (a waste product from animals and humans), minerals, and the sun to create their own food.

Tell students that they will be conducting investigations to learn more about the role of the sun in photosynthesis.

As a class or in small groups, provide two small green plants (basil or other herbs work well). Have students select places in the classroom to grow their plants that provide varying levels of sun. Ideally, one would be placed in direct sunlight and one would be placed in a location where little to no sun is received (a cabinet or closet).

Provide all plants with the proper amount of water. Observe the plants every few days. Record the differences in appearance and the affects of growing with or without sun.

Timesaver option for observations only: Set up the investigation approximately two weeks ahead of time. Show students the two plants when it is time to discuss photosynthesis; one plant grown with sun, one grown without. Allow students to make their observations.

### **Explain**

The plants grown without sun should be yellowed and possibly dying. There may be brown spots on the leaves. Explain that in a sense, the plant is starving.

Ask students what they notice about the color of the plant. What affect does the sun have on the color of the plant? Explain to students that the green in the plant has a very important connection to the sun and to photosynthesis.

Explain that the green in the plants is from chlorophyll. Chlorophyll is the part of the plant that absorbs the light energy from the sun! (Note: Plants of other colors also conduct photosynthesis (like trees with red or purple leaves). In these plants the chlorophyll is present, but is masked by other colors in the leaves.)

Without chlorophyll, photosynthesis could not take place and plants would not be able to create their own food!

Review the class definition of photosynthesis. Emphasize that plants absorb sunlight, CO<sub>2</sub>, water, and minerals to create their own food in the form of glucose or sugar. Chlorophyll is what absorbs the sun's energy in the plant to allow photosynthesis to occur. Chlorophyll is green.

Chlorophyll Challenge: Ask students if they know WHEN photosynthesis takes place. Because photosynthesis requires sunlight, photosynthesis takes place during the daytime.

What about photosynthesis in winter? The answer to that depends on the type of plant. But overall, there is much less photosynthesis taking place in winter.

### **Elaborate**

Share with students that chlorophyll is also very important in the diets of people. It has many health benefits and is abundant in healthy, green vegetables. Ask students to brainstorm a list of POWER PLANTS or plants that contain chlorophyll in the part of the plant that we eat (i.e. spinach, lettuce, etc.)

Reinforce photosynthesis knowledge by playing Photosynthesis Card Game – Go GROW (2 players). The rules of the game are similar to the card game, “Go Fish”.

The deck of cards consists of sunshine, water, minerals, CO<sub>2</sub>, glucose (sugar), and “I’m Hungry” cards.

The **nature’s resources deck** is the pile of all unused cards. The cards in a student’s hand are **their garden**. A **successful harvest** is when a student gets a complete set of photosynthesis cards: sunshine, water, minerals, CO<sub>2</sub>, and glucose (sugar). Their **harvest pile** is where they place their sets of five photosynthesis cards. The “I’m Hungry” cards don’t add value to a garden, but they don’t hurt it either. The **compost pile** is the stack of discarded cards.

The goal of the game is to get as many sets of complete photosynthesis cards as possible before the nature’s resources deck is gone.

Deal six cards to each student. They may look at their cards, but don’t show the cards to the other player.

The first player may ask the second player for a specific card. If the second player has this card, they must give it to the first player. If they do not, they tell the first player to “Go Grow.” The first player then takes a card from the nature’s resources deck.

If the first player has a complete set of the five photosynthesis cards, they have a successful harvest and places the five cards in their harvest pile. If not, they may choose to get rid of a card in their compost pile or wait and keep growing. It is now the other players turn.

A player can have as many cards in their hands as they choose. A player can never compost more than one card at a time.

Players continue taking turns until all the cards in the nature’s resources pile have been used.

The game is over when all the cards in the nature’s resources pile have been used and any possible complete photosynthesis sets have been harvested.

Each harvested set of photosynthesis cards is worth 7 points. Have each player add up how many points they have “harvested.”

Subtract one point from each player’s total for each card remaining in their garden (hands). The player with the most points wins.

### **Evaluate**

Go GREEN for a day to celebrate chlorophyll and photosynthesis. Encourage all students to wear something green. Make signs or stickers for students to wear that say, “I get my fill thanks to chlorophyll.”

Have students write a letter to their family that shares why chlorophyll is so important.

Test their knowledge of “the good green” by showcasing some green foods in class and asking them if the green is from chlorophyll. Food examples include: green lettuce, green milk, green beans, spinach, bell peppers, green soda, asparagus, green candy, sweet peas, etc. Consider adding some harder examples of plants that have chlorophyll but not in the part we eat (examples: sweet corn, apples, carrots).

### **Extension Ideas**

For older students:

Research specific health benefits of chlorophyll in the human diet.

For all students:

After observing the affects of a no-sunlight growing environment, place the plant back in a sunny growing space. Continue to care for the plant and make observations. How does the plant respond to sunlight? What changes are noticed first? Does it recover? If it recovers, how long does the plant take to recover?

### **Resources:**

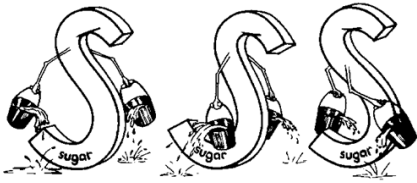
Photosynthesis Games for Kids

[http://www.ehow.com/list\\_6513312\\_photosynthesis-games-kids.html](http://www.ehow.com/list_6513312_photosynthesis-games-kids.html)

# Go GROW!

## Photosynthesis Card Game

Glucose



Glucose

I'm HUNGRY!



I'm HUNGRY!

The goal of the game is to get as many sets of complete photosynthesis cards as possible before the nature's resources deck is gone. The deck of cards consists of sunshine, water, minerals, CO<sub>2</sub>, glucose (sugar), and "I'm Hungry" cards. Make NINE copies of each of the cards. The nature's resources deck is the pile of all unused cards. The cards in a student's hand are their garden. A successful harvest is when a student gets a complete set of photosynthesis cards: sunshine, water, minerals, CO<sub>2</sub>, and glucose (sugar). Their harvest pile is where they place their sets of five photosynthesis cards. The "I'm Hungry" cards don't add value to a garden, but they don't hurt it either. The compost pile is the stack of discarded cards.

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Go GROW!

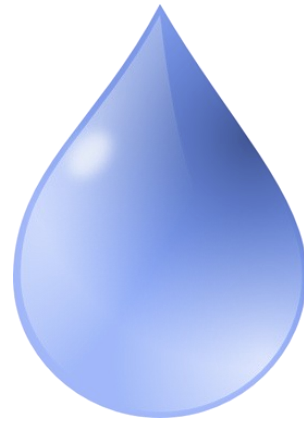
Photosynthesis Card Game

Sunshine



Sunshine

Water



Water

Minerals



Minerals

CO<sub>2</sub>



CO<sub>2</sub>