



## TEXAS 4-H EXPLORE 4-H PROJECT RESOURCE TEMPLATE

**Title of Explore Book:** Explore the Scientific Method **Photosynthesis**

**Grade Level:** 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup>

**TEKS:** Science (4.9A-B), (4.10 A-C), (5.9 A-D), (5.10 A-C). Math (4.13 A-C), (4.15 A)

**Title of Lesson:** Photosynthesis and the Effects of Light

### **Objectives (2 to 4):**

The participants will:

Learn the Steps of the Scientific Method

Learn about photosynthesis

Practice the 15 SET Abilities (build, categorize, collaborate, demonstrate, describe, contrast, solve, design, evaluate, hypothesize, invent, infer, interpret, measure and learn basics of graphical representation) Are all of these practiced in this activity?

### **Supplies:**

1 Carton cardboard? box

Black constructive paper

8 plastic pots (all similar in size and color)

8 plant seeds (any seed that germinates quickly)

Soil mix (enough to fill up the 8 plastic pots)

Ruler

Watering container

### **Time Allotment 60-90 minutes for initial experience with follow-up observations of 30 minutes**

Seeds generally germinate after a week, after germination plants were watered and observed every other day for three weeks.

### **Explore the Content:**

Vocabulary: Define these

Photosynthesis is a process used by plants and other organisms to convert light energy, normally from the Sun, into chemical energy that can be later released to fuel the organisms' activities (energy transformation)

Roots the part of a plant that attaches it to the ground or to a support, typically underground, conveying water and nourishment to the rest of the plant via numerous branches and fibers

Stem the main body or stalk of a plant or shrub, typically rising above ground but occasionally subterranean

Leaves a flattened structure of a higher plant, typically green and bladelike, that is attached to a stem directly or via a stalk. Leaves are the main organs of photosynthesis and transpiration

Seeds a flowering plant's unit of reproduction, capable of developing into another such plant

Flower Also known as a bloom or blossom, is the reproductive structure found in plants that are floral

Fruit is the seed-bearing structure in flowering plants formed from the ovary after flowering.

Main Question: Do plants grow better under light or in the dark?

Independent variable: Light and Dark

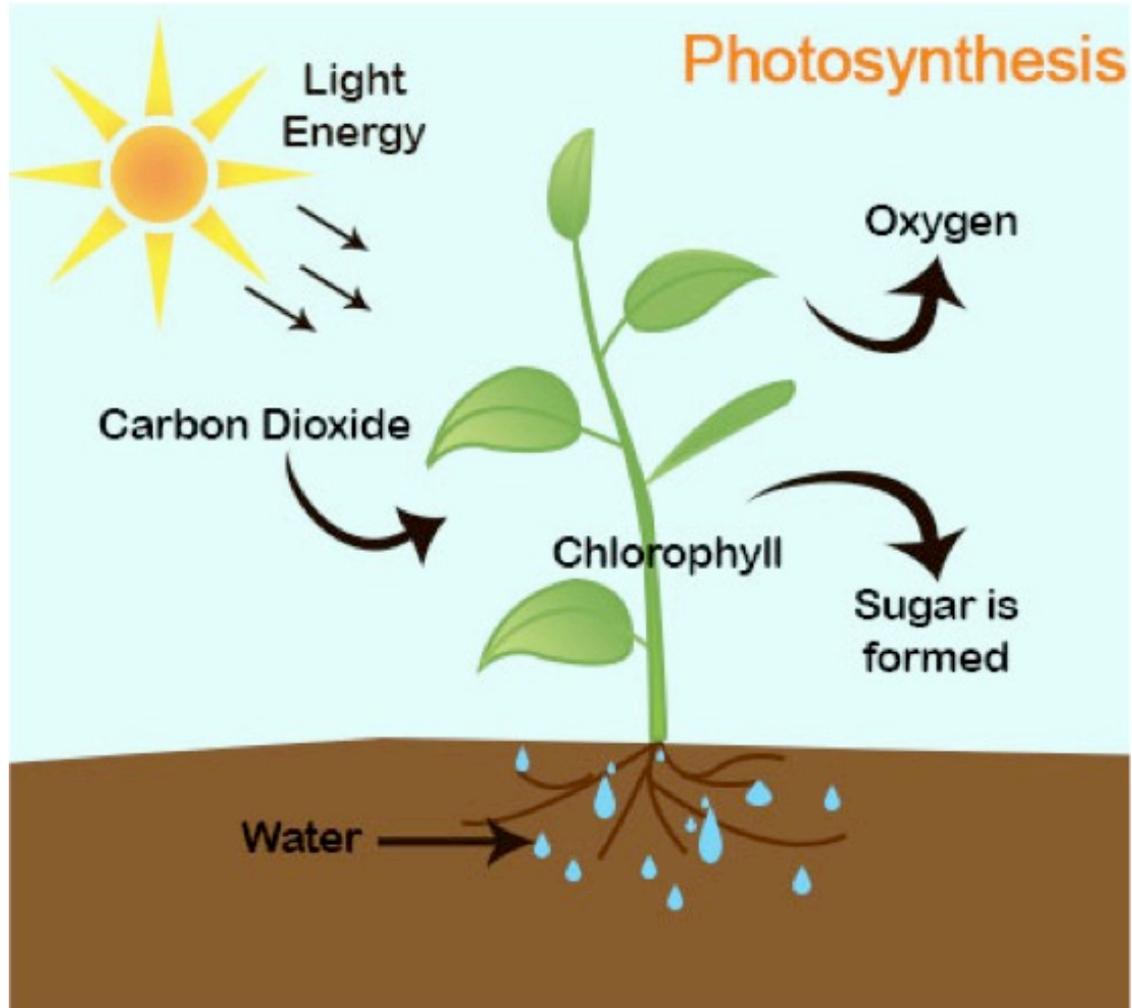
Dependent variable: Plant's height in centimeters

Possible Hypothesis: The plants under the light will grow higher than the plants in the dark.  
The plants in the dark will grow less than the plants under the light.

### **Do (Activity/Experience):**

#### Activity 1

Learn the steps for photosynthesis to happened – could these be separated and the activity would include youth putting them in the correct order with definitions for each part?



## Activity 2

### Conduct Your Own Research Project

#### Set up your area

1. Find a carton cardboard box that will fit 4 of the plastic pots and cover it with black constructive paper so the light doesn't penetrate inside the box. Plan to maintain a temperature around 23°C - 25°C.
2. Find an open area where you can place the other 4 pots. Plan to keep the second container at room temperature (21-24°C)
3. Properly label each plastic pot (treatment (is these 4 lights and 4 dark? and plant number 1-8).
4. Begin Your Experiment
5. Fill pot with soil and place one seed per container one and a half inch deep.
6. Wet soil and water all plants every other day or as needed.
7. After germination place 4 of the plants marked as dark under the black carton box and let the other 4 remain in the natural light of the room
8. Observe during 4 to 8 weeks and collect data using a data log sheet.

9. Note: Be sure to control the temperature inside and outside the box so it is consistent (use a thermometer to monitor temperature).

Day	Plant Number	Treatment (Light or Dark)	Plant height	Observations

**Reflect:**

Did you notice any differences between the plants that were under the box and the ones that were outside the black box?

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Which plants grew higher? The ones under the box or the ones outside the box?  
Were all plants the same color?

**Apply:**

Report your results in a scientific manner – see handout at end for a graphic representation  
Scientific Posters are commonly used to share your scientific project including the results.

Typically, a Scientific Posters will have the following parts:

Abstract: The summary of the experiment which includes the purpose of the experiment, and no more than three sentences explaining the procedure, results, and conclusion.

Introduction: Describes the problem or goal of the experiment, it offers background information about; the entity, independent variable, dependent variable and the hypothesis.

Materials and Methods: It describes the experiment's design ; what materials were used, how the data was collected, how often data was collected, and how the data was analyzed. Pictures and tables can be used for this section. .

Results: Describes and displays data using; tables, photographs. Remember - the figures must always have a descriptive text (figures and tables must have a title number and units of measurement).

Conclusions: The first sentence restates the hypothesis or research question and the second should answer the research question with additional sentences explaining the results and procedures that influenced the results.

References: If images from the web were used, it is important to refer the website used. The common method to cite the sources is APA style. (you find instructions for APA style on the internet)

Acknowledgments: A formal printed statement that recognizes individuals and institutions that contributed to the work being reported.

## Example



# Photosynthesis

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## Abstract

Photosynthesis is important because it keeps plants alive and helps the plants give off oxygen for animals and humans. Without photosynthesis, animals and people would die. The purpose of the experiment is to find out if plants grow better in the dark or in the light. For this experiment, eight cotton seeds were planted into cups. The results were that the plants in the light outgrew the plants in the dark.

## Introduction

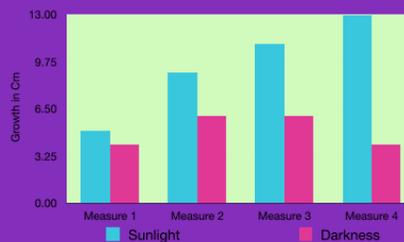
This class is discovering how photosynthesis works. Photosynthesis produces oxygen, so humans and animals can live. In the word photosynthesis, photo means light, and synthesis means putting together. So, the whole word (photosynthesis) means putting together with light. The plants put carbon dioxide, water, and sunlight together to make their own food. The purpose of the experiment was to find out how photosynthesis works with plants. The independent variables are light and darkness. The dependent variable is plant growth in centimeters. This group's hypothesis was that the plants in the light will grow bigger than the plants in the dark.

## Materials and Methods

In order to complete the experiment, soil was placed into eight cups. A hole was poked into the soil for the seed to be placed in the hole. Two cups of water was placed in each cup. The team number and the words light and dark were added to the cups. A box was covered with black piece of paper so that four of the plants could be placed in the dark. The cups were placed in the greenhouse. After waiting a week, it was observed that the seeds died. New seeds were planted into new containers. After a week, the plants sprouted. Four plants were placed in the light and four in the dark. The plants were measured using a centimeter ruler. Using the centimeter ruler, the plant was measured from the top of the soil to the top of the plant. This was done four times over about three weeks. The data was recorded on a data chart.



## Results



## Conclusion

This group's hypothesis is the plants in the light will grow bigger than the plants in the dark. The hypothesis was correct. The data from measuring the plants showed that the plants in the dark were wilting and the ones in the light grew bigger. These results were obtained because plants need sunlight so they can grow and make their own food. Plants make their own food using the process called photosynthesis. Photosynthesis needs sunlight, carbon dioxide, water, and soil.

## References

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## Acknowledgements

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## References:

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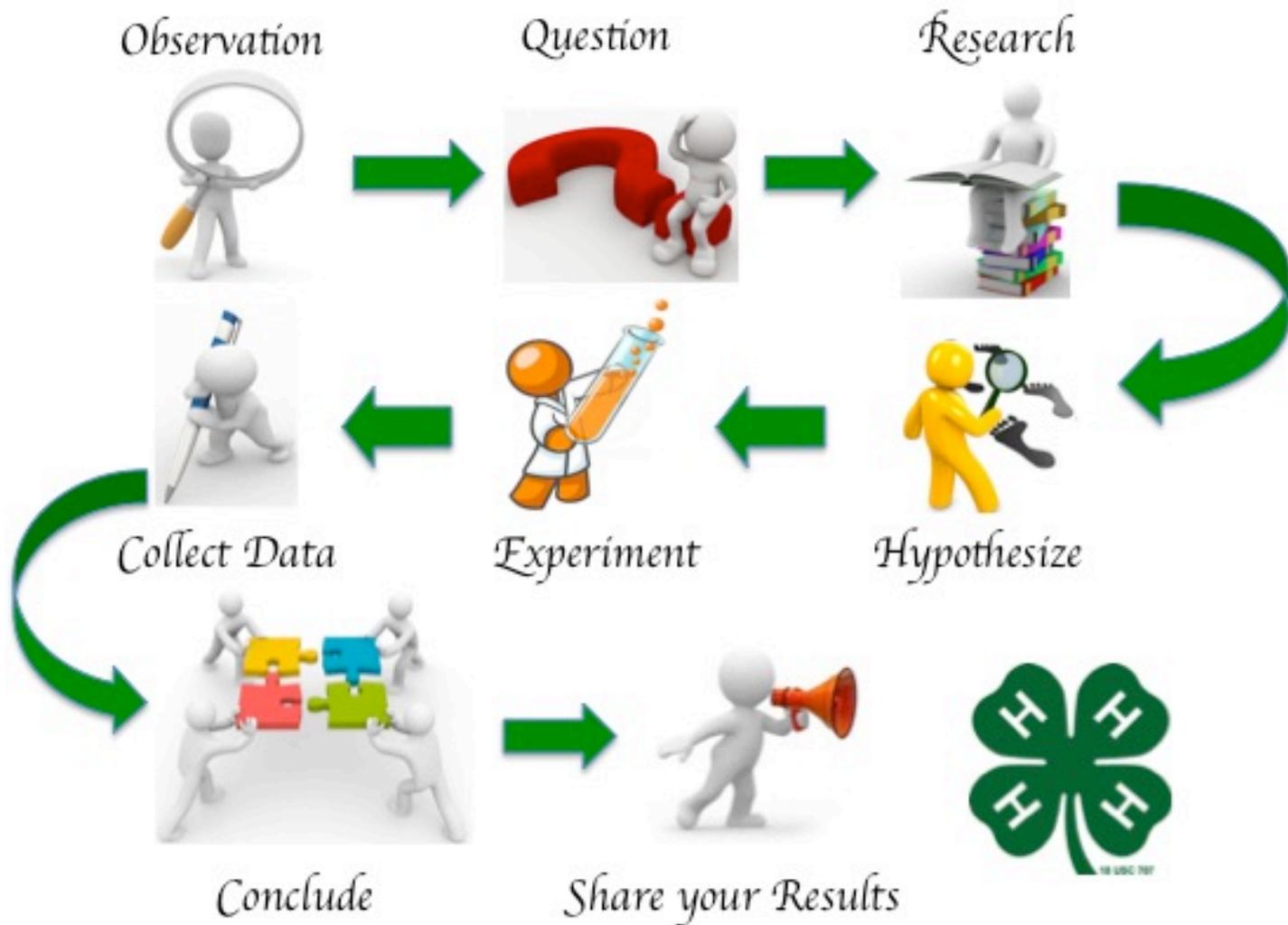
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## Photosynthesis

[https://www.youtube.com/watch?v=sQK3Yr4Sc\\_k](https://www.youtube.com/watch?v=sQK3Yr4Sc_k)

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# The scientific Method



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