

## ACTIVITY SNAPSHOT

### SUPPORTING AREAS

Food, plant growth, sunlight, energy

### PURPOSE

Students will explore different types of light and identify its importance in growing plants.

### MATERIALS

- [Desktop Greenhouses Kit](#)
- Desktop Greenhouse Observation Sheets
- [Image \(Manhattan Image\)](#)



## *Shining a light on sunlight - Pt 1*

*Lesson Four*

*Adapted from National Center for Agricultural Literacy*

### ACTIVITY SUMMARY

Students will investigate the importance of light in their Tower Garden by creating a desktop greenhouse to investigate the process of light.

### VOCABULARY WORDS

- **aquaponics:** a system of aquaculture in which the waste produced by farmed fish or other aquatic animals supplies nutrients for plants grown hydroponically, which in turn purify the water
- **grow light:** an artificial light source designed to stimulate plant growth by emitting a light appropriate for photosynthesis
- **hydroponics:** the method of cultivating plants using a mineral nutrient solution in a water solvent without the use of soil
- **indoor farming:** a method of growing crops or plants, usually on a large scale, entirely indoors
- **vertical farming:** the practice of growing plants and produce in a vertical orientation, maximizing the use of the location's space

## BACKGROUND INFORMATION

Source: [Desktop Greenhouses](#) 


Light requirements vary by plant species. Green plants need light to perform photosynthesis, although the intensity, quality, and duration needs will differ by plant. Understanding the light preferences of a plant is important when choosing an appropriate planting location and/or light source.

A **grow light** is an artificial light source designed to stimulate plant growth by emitting a light appropriate for photosynthesis. The purpose of a grow light is to replicate the natural solar spectrum of sunlight or to provide a light spectrum tailored to the needs of a particular plant. There are three main types of grow lights—fluorescent, LED (light-emitting diodes), and HID (high-intensity discharge). Grow lights differ from traditional light bulbs that are used to light homes. Unlike a traditional light bulb, grow lights produce the full spectrum of light and appropriate intensity necessary for photosynthesis. Grow lights also produce less heat than a traditional bulb, which prevents the scorching of plants.

## WHAT'S THE CONNECTION TO AGRICULTURE?

Indoor farming is a method of growing crops or plants, usually on a large scale, entirely indoors. This method of growing crops utilizes grow lights or a combination of artificial light and sunlight in a greenhouse setting. Aquaponics, hydroponics, and vertical farming are all examples of indoor farming. Indoor farming is popular in urban areas where less land is available for growing crops or soil is contaminated. The crops grown in indoor farms can be used to boost local food supplies, provide locally grown fresh food throughout the year, and provide access to nutritious food. Indoor farming enables growers to have increased control over the environment when compared to traditional growing conditions.

## INTEREST APPROACH

1. Ask the students, “Based on what they have learned so far, where is the food you eat grown?”
  - *On a farm or in a garden*
2. Project this [image](#)  (Manhattan Image) onto a large screen. Ask students, “Can food be grown here?”
  - *Most students will answer no.*
3. Ask students, “Is there a resource they have in their classroom that could give cities the opportunity to grow their own produce?”
  - *Yes – the Tower gardens in their classroom can give metropolitan areas the ability to produce nutritious food on their own!*

## ACTIVITY PROCEDURE

### *Preparation*

**Teacher Note:** We recommend beginning this investigation on a Friday (Day 1) to allow for germination of the seeds over the weekend. Lights will be added to the greenhouse the following Monday (Day 4), plant observations and data collection take place throughout the week, and the investigation will be completed the following Friday (Day 8). This schedule allows for key procedures to take place on school days as opposed to the weekend.

Prior to this activity, an adult should prepare the desktop greenhouse lids. For each lid, cut out a lid-sized disk from black card stock, place on top of the lid, and secure it with two layers of electrical tape so that

no clear part of the lid is exposed. Watch the [Desktop Greenhouses](#) video to view a tutorial on how to set up the greenhouses.

## Procedures

### Activity 1: Do Plants Need Light?

#### Day 1

1. Explain to the students that they are going to investigate the importance of light to plants by creating desktop greenhouses.
2. Organize the students into partners or small groups. Provide each group with 2 clear plastic cups, 2 black plastic cups, 2 prepared lids, 2 labeling stickers, 2 peat pellets, a bag of seeds, access to water, a mL measuring cup, a 1/8 teaspoon, and a permanent marker.
3. Instruct the students to label both clear plastic cups with their name, the date, and the type of seed they are planting. Label one greenhouse with the number 1 and the other greenhouse with the number 2.
4. Fill each of the cups with 50 mL of water or mark a line on each cup 3/4 inch from the bottom and fill the cups up to the line with water.
5. Place a peat pellet, with the small hole facing up, into each of the cups of water.
6. It takes about 15 minutes for the peat pellets to hydrate and expand. When the peat pots are completely hydrated, use a pencil to loosen the top 1/4 inch of peat moss.
7. Evenly spread 1/8 teaspoon of seeds on top of each of the peat pots. Press the seeds down gently with your finger so that they contact the damp peat.
8. Have each group write their names, the date, and the type of seed they are planting on two stickers and place one on each of the black plastic cups. Label one greenhouse with the number 1 and the other greenhouse with the number 2.
9. Provide each student with the [Desktop Greenhouse Observation Sheets](#). Have the students complete the observations for Day 1.
10. Put the clear cups inside the black cups (be sure to match the numbers correctly 1 or 2) and place a prepared lid onto each of the greenhouses.
11. Place the greenhouses onto a countertop or table out of the way of direct sunlight.
12. Ask the students if they think seeds need light to germinate. After listening to the students' responses, explain that they will allow time for the seeds to germinate in the dark greenhouses and check the progress on Day 4. Do not open the greenhouses until Day 4.

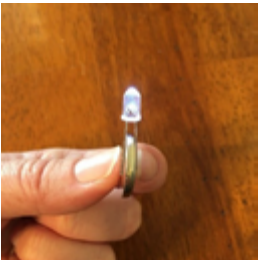


## Day 4

### Preparation

Prior to this activity, an adult should use a craft knife to cut an X (similar to the straw X in the plastic lid) into the top of the greenhouse lid through the black card stock disk and plastic lid for each student's greenhouse number 1 lid only. Do not cut an X for greenhouse number 2. The students will place their LED light through this X.

1. Have the students check their greenhouses and complete the observations for Day 4 on their *Desktop Greenhouse Observation Sheet*.
2. Lead a discussion about the question from Day 1, "Do seeds need light to germinate?" Integrate the following points into the discussion:
  - The seeds in the desktop greenhouses were not exposed to light and germinated.
  - Most seeds germinate best in dark conditions.
  - Seeds are dormant until they are exposed to specific conditions.
  - Seeds require the proper amount of warmth, moisture, and air to germinate.
3. Ask the students, "Do plants need light to grow and be healthy?" After listening to the students' responses, explain that they will add an LED light to one of their greenhouses.
4. Provide each student with a 3-volt battery, an LED light, and a 4" piece of black electrical tape. Explain to the students that the battery will provide power to the LED light.
5. Have the students straddle the light's prongs around the battery so that the longer prong is touching the positive side of the battery. Once the light is lit, hold the prongs in place by wrapping the electrical tape around the prongs and battery.



6. Insert the light into the X on the greenhouse lid.
7. Explain to the students that they will observe any changes in the plants for the next four days.
8. Ask the students, "Do they think they will see any differences between the plant growing in the greenhouse with the light and the plant in the dark greenhouse?" If they answer yes, ask them what kind of differences they think they will see. Have the students predict which plant they think will be healthiest and record their prediction on their observation sheet.

## Days 5-8

1. Allow time each day for students to observe their plants.
2. Have the students record their observations on their *Desktop Greenhouse Observation Sheet*.
3. On Day 8, discuss the differences the students observed between their plant growing in the greenhouse with the light and their plant in the dark greenhouse. Which plant is the healthiest? Was their prediction correct?

4. Have the students record their conclusions on their observation sheet



### CONCEPT ELABORATION AND EVALUATION

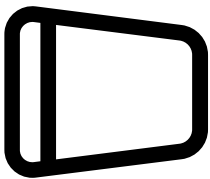
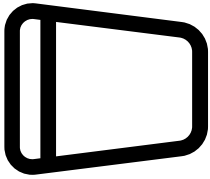
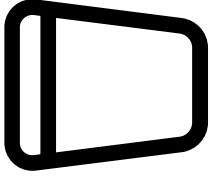
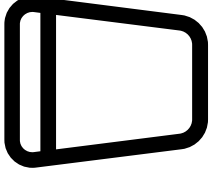
1. Which plants were healthier?
  - *The plants in the desktop greenhouse with light*
2. What do plants require to survive and grow?
  - *Nutrients, water, air, and light*
3. Which light requirements vary by plant species?
  - *Intensity, quality, and duration*
4. Can all light bulbs be used as grow lights?
  - *No*
5. Do plants also need rest from light?
  - *Yes*



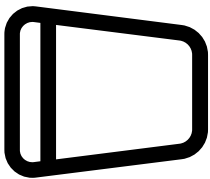
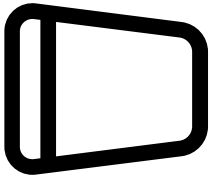
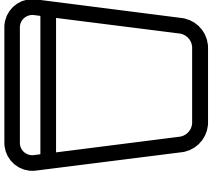
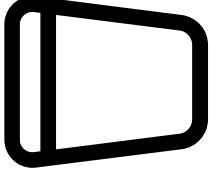
# *Manhattan - Image*



# Desktop Greenhouse Observation Sheet

<i>Day 1</i>		<i>Day 4</i>	
Greenhouse 1	Greenhouse 2	Greenhouse 1	Greenhouse 2
			

# Desktop Greenhouse Observation Sheet

Day 5		Day 6	
Greenhouse 1	Greenhouse 2	Greenhouse 1	Greenhouse 2
			



# Desktop Greenhouse Observation Sheet

Day 7		Day 8	
Greenhouse 1	Greenhouse 2	Greenhouse 1	Greenhouse 2
