LESSONS TO GROW BY

Pollinators

This month we are learning about our good garden friends the pollinators. Who are the pollinators? Bees, hummingbirds, moths, bats, butterflies, flies, and beetles are a few notable representatives. Pollinators are animals that help many flowering plants produce their seeds and thus ensure the continued existence of millions of plant species, and in turn, of most animal species, including humans. Each week we will dig into a different pollination-focused topic and provide instructions for engaging, hands-on lessons. By the end of the month we hope your young gardeners will understand the intricate relationship between pollinators and flowering plants and also learn to love, respect, and appreciate these hard-working animals.

Week 3: Why do we need pollinators?

Learning Objectives

This week kids will:

- Discover why seeds are so important
- Investigate some of the common fruits and vegetables we eat that rely on pollinators
- Explore all of the ways plants are important in our environment

Materials Needed for the Week:

- Activity 1: What Do Seeds Do?
  - Dried beans from the soup aisle or bulk bins at the grocery store
  - Paper towels
  - Plastic sandwich bag
  - Assortment of common fruits and vegetables with seeds (optional)
  - Small disposable cups or cartons (optional)
  - Potting soil (optional)

- Activity 2: Pollinators Fill My Plate
  - Making Seeds Reading Page
  - Old magazines, seed catalogs, or newspaper grocery store ads

- Craft paper
- Glue stick
- Fruits and vegetables for snack (optional)
- Pollinator Food Diary (optional)

- Activity 3: Plants Run Our World
  - Sticky notes or stickers or
  - Paper, clipboard and pencil or
  - Digital camera/ phone with a camera

Introduction

More than 150 of our common food crops, from avocados to zucchini, rely on pollinators to move pollen among flowers to facilitate fertilization, which ultimately leads to the development of fruits and seeds. Pollination by bees, hummingbirds, moths, bats, butterflies, flies, and beetles ensures the continued existence of millions of plant species, and in turn, of most animal species, including humans – in fact, one of every three mouthfuls of our food depends on them. The following list from the Pollinator Partnership* includes common fruits and vegetables that rely on pollinators:

Fruit: Apples, bananas, blackberries, blueberries, cherries, figs, grapes, grapefruit, kiwi fruit, mango, melons, peach, pear, raspberries, strawberries

Nuts: Almonds, cashews, coconuts

Vegetables: Avocados, beets, broccoli, cabbage, carrots, cauliflower, cucumbers, onion, potatoes, pumpkin, squash, zucchini

Seeds: Flax, sesame, sunflowers

Additional Favorite Treats: Chocolate, coffee, vanilla, sugarcane, tea

Pollinators also help pollinate plants that are important sources of food for wildlife of all sizes, from birds to bears. Their impact goes far beyond edible crops too. Pollinators help produce the seeds of many other plants that play important roles in keeping our ecosystem healthy and habitable for all life.

*https://www.pollinator.org/list-of-pollinated-food

Activity 1: What Do Seeds Do?

1. Each seed contains a tiny baby plant. Plants do not live forever, so they need seeds to grow more plants that will replace them when they die. In this activity, kids will plant seeds to confirm that seeds do in fact make new plants.

2. Give kids a chance to look at an assortment of seeds. Some of the easiest and least expensive seeds to plant are dried bean seeds that are available in bags in the soup aisle of your grocery store. You do not even need soil to watch them grow. Ask them to use some of their senses to explore the seeds. What do they look like? What do they feel like? What do they smell like?

If you have multiple kinds of bean seeds, sort them by their characteristics. You can place them order by size, compare weight, or group them by color and pattern.

Ask kids to create a hypothesis about what they think seeds do. What is their purpose?

3. Plant your seeds. Many seeds, including dry bean seeds, do not need soil to start growing. Moisten a paper towel and then fold it to fit inside of a plastic sandwich bag. Place a few dried bean seeds inside and seal the bag. If you want to speed up the growing process, soak your bean seeds in water for a few hours before placing them in the plastic bag.

4. Put the bag in a warm spot and within a couple of days your seeds will germinate and you will be able to see roots and stems develop. Review your hypothesis. What is the purpose of a seed? Why is that important?

5. An alternative to planting bean seeds, you can also gather an assortment of fruits and vegetables* from your garden, farmer's market, or grocery store that contain seeds and experiment planting your harvested seeds instead.

**Note: Many of our vegetables are by botanical classification actually fruits, such as tomatoes, squash, and peppers. They are commonly called vegetables because they are consumed as part of a meal or savory dish. The term fruit is used to describe produce that is sweet and consumed as a dessert or snack.*

Although you can try placing them in a bag with a moist paper towel as described above, many of these seeds will be more successful if planted in potting soil and a container. You can use repurposed plastic cups or milk cartons with holes punched in the bottom for your container. Moisten your soil, place in the container and then plant your seeds.

You will have mixed success with seeds collected this way because we harvest some fruits and vegetables to eat before the seeds are fully developed. (By the time the seeds are ready, the fruit/vegetable may be too ripe for us to eat.) Some seeds you may want to try: watermelon, citrus, peppers, pumpkin and avocados.

6. Connect your seed-planting activity to pollinators. Remind kids that pollinators help plants make fruit and seeds by carrying pollen from one flower to another flower. Without the help of pollinators many plants would not be able to make seeds, which means they would not be able to make new plants, and they would eventually disappear from our planet.

Check out the KidsGardening article on Seed Viewers, https://kidsgardening.org/garden-activities-seed-viewer, for an additional idea for growing your seeds using a clear plastic cup and paper towels.

Activity 2: Pollinators Fill My Plate

1. Read the Making Seeds Reading Page together or independently. Answer and discuss the reading comprehension questions. From this reading page, what did we learn about why pollinators are so important?

2. Review the list of fruits and vegetables that rely on pollinators to make their fruit and seeds. Cut out pictures of some of these pollinator-dependent products from old magazines, seed catalogs, or the grocery store ads from old newspapers. Make a collage on a piece of craft paper of fruit and vegetables we are able to enjoy because of the hard work of pollinators.

If resources are available, you can laminate this collage or place it in between sheets of contact paper to use it as a placemat.

3. You can expand on this activity by making a pollinator-supplied snack that includes ingredients that pollinators helped produce. Your snack can be as simple as apple slices, or you can also use this opportunity to practice math skills with a more elaborate recipe. Here are a few great websites you may want to check out for recipe ideas:

ChopChop Family: https://www.chopchopfamily.org/recipes/

Cooking Matters: http://cookingmatters.org/recipes

Common Bytes: https://www.commonbytes.org/#!/recipes

4. Another possible follow-up to continue to grow your young gardeners' awareness about the importance of pollinators to our diet is to keep a Pollinator Food Diary. Ask them to record the foods they eat each day that can be tracked back to the hard work of pollinators. A sample diary worksheet is included in this week's materials.

Activity 3: Plants Run Our World

1. Let's think beyond our plates! We rely on a host of plant-made products to meet our basic needs, and plants serve an indispensible role in our ecosystem, too. Plants are the producers at the bottom of every food chain due to their amazing ability to transform the energy of the sun into food (carbohydrates) through photosynthesis. They are also key to air, water, and soil health. There literally would be no life on this planet without plants. How is that for being important? If plants are so important, discuss how this relates to pollinators. Why would it be critical to have a secure way to make new plants?

2. Let's go on a plant product hunt. Ask your kids to look around their classroom or home and identify products that are derived from plants. There are a couple of different ways to do this depending on the resources available and skills you would like to practice. If you would like to hone writing skills, give each child a piece of paper, a clipboard and a writing utensil and have them list out all of the plant products they see on their hunt. If you want to make it feel more like a game, give each child a pack of sticky notes or stickers and have them label each plant-derived product they identify and then go back

and count how many they found. Finally, if you want to make your hunt more visual, you can ask them to take photos or drawings of the products they find. They can follow this up by turning their drawings/photos into a slide presentation or journal entry page that could be shared with others.

Some items they may find on their hunt include:

- Foods: Grains, vegetables, and fruits
- Spices and herbs: Cinnamon, pepper, vanilla, mint, etc.
- Special treats: Tea, coffee, sugar, chocolate
- Cooking oil
- Animal food/birdseed
- Medicines (aspirin)
- Fabric (cotton, linen)
- Natural ropes
- Lumber/building materials
- Furniture (wooden)
- Rubber
- Cork
- Bamboo
- Fuel
- Wood for fireplaces
- Paper of all kinds
- Cardboard
- Oxygen (air)

3. It won't take long for kids to see how plants and plant products surround them. Take this activity a step further and ask them, what does the importance of plants in our lives mean for the importance of pollinators?

As explained in this week's reading page, not all plants rely on pollinators to make their seeds. Large trees and grass plants tend to rely on wind to move their pollen around. However, most smaller plants, including the fruits and vegetables we eat, rely on the hard work of pollinators. And so do many of the understory plants in wooded areas which are the main food source for wild animals (understory plants do not get exposed to as much wind movement because it is blocked by the bigger trees). Pollinator-aided seed production is also attributed to additional benefits. Pollination by pollinators is considered more efficient than wind pollination. Also, pollen transfer between plants can lead to more diversity in the offspring.

4. Extend your exploration by taking kids on a plant walk in your garden, yard, or a local greenspace and predict which plants you think are pollinated by pollinators and which rely on wind or water for pollination. Use the plants' characteristics, such as flower shape or overall plant shape and size, as a clue. Are the flowers bright and colorful so they look like they might attract pollinators? Are the flowers small, numerous, and drooping from stems so they look like they would easily be picked up by the wind? Are the plants shorter and blocked from the wind by taller trees? Are the flowers in a meadow where wind moves freely? If flowers are present on the plant, do you see any pollinator activity? When you return home or to the classroom, an Internet search can be used to help you confirm your predictions.

Digging Deeper

You can use the following resources to dig deeper into this week's lessons.

Books

A Seed is Sleepy by Dianna Hutts Aston
A beautiful overview all about seeds.

The Giving Tree by Shel Silverstein
A classic tale illustrating the many ways trees contribute to our lives.

The Great Kapok Tree: A Tale of the Amazon Rain Forest by Lynne Cherry
With vivid illustrations, this book demonstrates how all life in an ecosystem works together and also highlights the importance of plants.

Videos

Time Lapse of a Bean Plant: https://www.youtube.com/watch?v=w77zPAtVTuI

Sunflower Growing Time Lapse: https://www.youtube.com/watch?v=VolHs1sFrZM

Timelapse of Sunflower from Seed to Flower: https://www.youtube.com/watch?v=Z-iPp6yn0hw

Big Green Seed Scavenger Hunt with Elisa and Little Green Chefs Rainbow Spinach Summer Rolls: https://biggreen.org/teaching-in-your-garden/video-library/

The Lorax: https://www.youtube.com/watch?v=1bHdzTUNw-4

Additional Related KidsGardening Lessons and Activities to Try

Pollinator Celebration Meal: https://kidsgardening.org/garden-activities-pollinator-celebration-meal/

Photosynthesis Runs the World: https://kidsgardening.org/lesson-plan-photosynthesis/

Petal Attraction: https://kidsgardening.org/lesson-plans-petal-attraction/

Plant Families for Pollinators: https://kidsgardening.org/garden-how-to-plant-families-for-pollinators/

Flower Adaptations to Lure Pollinators: https://kidsgardening.org/garden-how-to-flower-adaptations/

Choosing Flowers to Attract a Diversity of Pollinators: https://kidsgardening.org/garden-how-to-welcome-pollinators/

Pollinator Journal: https://kidsgardening.org/garden-activities-pollinator-journal/

Making Seeds

Reading page for Pollinators week 2: Who are the pollinators?

Have you ever seen seeds inside of a piece of fruit like an apple, orange, or watermelon? What about inside of a vegetable like a cucumber, tomato, or squash? What do those little things do?

Although it may be hard to imagine, inside each seed is a very tiny baby plant. When the seed is exposed to the right conditions, which often include warm temperatures and moisture, then the new plant will start to grow. Why are seeds so important?

Most of the plants growing on Earth today depend on seeds to make new plants to replace themselves when they die. There are many different kinds of plants and some have developed other ways to make more plants. However, most rely on seeds to ensure their survival.

To make seeds (usually inside of fruits), many plants need the help of pollinators. Pollinators are animals that carry pollen from one flower to another flower, resulting in the growth of fruit and seeds. Some plants will not produce any seeds without the help of pollinators. Apple trees will not grow apples (and apple seeds) without the help of pollinators. Other plants may be able to make some fruit and seeds without the help pollinators because their pollen will move with the wind or rain too, but they can make a lot more if pollinators help them out. Orange trees can grow oranges (and orange seeds) without the help of pollinators, but they will make a lot more oranges if there are

pollinators to help them. Some plants do not need pollinators to help them make seeds at all. Grass and corn plants get help from the wind to move their pollen.

Here is a list of some of our common edible crops that get help from pollinators to make their fruits and seeds:

Fruit: Apples, bananas, blackberries, blueberries, cherries, figs, grapes, grapefruit, kiwi fruit, mango, melons, peach, pear, raspberries, strawberries

Nuts: Almonds, cashews, coconuts

Vegetables: Avocados, beets, broccoli, cabbage, carrots, cauliflower, cucumbers, onion, potatoes, pumpkin, squash, zucchini

Seeds: Flax, sesame, sunflowers

Additional Favorite Treats: Chocolate, coffee, vanilla, sugarcane, tea

Do you see anything you like to eat on the list? Just think, without pollinators helping these plants make seeds you may not be able to enjoy this tasty and healthy treat.

You might look at the list and see that not all of the things on the list are fruits that we eat. Carrots are the roots of the plant, so why should we care if they make fruit and seeds when we just want to eat their roots? Although we may dig up carrots to eat their crunchy roots, gardeners and farmers also leave some of the carrots in the ground so they can make flowers and eventually make new seeds. Without some of the carrot plants being left in the garden to make new seeds, we would not be able to grow more carrots.

In addition to the foods we eat, pollinators help make seeds for plants and trees that make oxygen for our air, give us wood for building our homes, and keep our soil healthy and water clean. Pollinators are very important to our lives. Have you thanked a pollinator today?

Reading Comprehension Questions:

1. Pollinators help plants make:
    A. Leaves
    B. Roots
    C. Stems
    D. Fruit and seeds

2. True or false, all plants need pollinators to help them make seeds:
    True
    False

3. In what ways do plants help people?
    A. They provide food for us.
    B. The provide oxygen for our air.
    C. They provide wood for our homes.
    D. They keep our soil and water healthy.
    E. All of the above.

4. True or false, pollinators only help plants. They are not important for people.
    True
    False

5. List a fruit or vegetable that is grown with the help of pollinators that you like to eat:

Pollinator Food Diary

Date/Meal	Menu Item	Top 3 Ingredients in Menu Item	Does this menu item or ingredient rely on pollinators?