Flower Power (Grades 6-8)

Grade Levels

6 - 8

Purpose

Students will observe the anatomical structures of flowers and explain a flower's role in plant growth and reproduction as well as their connection to our food supply.

Estimated Time

Two 40-minute sessions

Materials Needed

Interest Approach:

- Fruit Development (https://www.youtube.com/watch?v=sEwmUbzN_-g) video clip

Activity 1:

- *Flower Power: Anatomy and Function* handout, 1 per student
- *Flower Dissection Lab* handout, 1 per student
- *Flower Anatomy* PowerPoint
- Cut flowers, 1 per student
  - Contact a local florist and ask if they have some old flowers they will be discarding; look for flowers that exhibit easily identifiable parts. Carnations are recommended.)
- Clear tape

Activity 2:

- 6" x 6" colored origami paper,* 4–5 pieces of each color per student
- Green chenille stems (15 mm x 12"),* 1 per student
- White chenille stems (6 mm x 6"),* 1 per student
- Yellow chenille stems (6 mm x 6"),* 4 per student
- Green bump chenille stems (15 mm x 12"),* 1 per student
- Green tissue paper (3" x 3"),* 1 per student
- Yellow pony beads (6 mm x 9 mm),* 2 per student
- White pony beads (6 mm x 9 mm),* 5 per student
- Glue sticks
- Scissors
- Origami Flower Instructions PowerPoint (https://cdn.agclassroom.org/media/uploads/2015/05/07/Origami_flower_instructions.pptx)

*These materials are included in the Origami Parts of a Flower Kit (https://agclassroomstore.com/origami-parts-of-a-flower/), which is available for purchase from agclassroomstore.com.

Activity 3:

- Pollination: Trading Food for Fertilization (https://www.youtube.com/watch?v=LiczM-w3V-U) video
- CUCUMBER | How Does it Grow? (https://www.youtube.com/watch?v=Ua1TbZAyqjc&list=PLv9GnIwtmHxAhT90iRqip49gGm7rNBCkU&index=3)

(Optional) Activity 4:

- What's the Waggle Dance? And Why Do Honeybees Do It? (https://www.youtube.com/watch?v=LU_KD1enR3Q) video

- 4–5 treat bags (treats selected at your discretion)
- Honey, I'd Love to Dance (https://cdn.agclassroom.org/media/uploads/2015/05/06/HoneyDance_1.pdf) handout
- Written directions to each hidden treat bag

Essential Files (maps, charts, pictures, or documents)

- Flower Anatomy PowerPoint (https://cdn.agclassroom.org/media/uploads/2020/02/10/Flower_Anatomy.pptx)
- Flower Dissection Lab Sheet (https://cdn.agclassroom.org/media/uploads/2020/02/10/Flower_Dissection_Lab.pdf)
- Flower Power - Anatomy & Function handout (https://cdn.agclassroom.org/media/uploads/2020/02/10/Flower_Power-_Anatomy__Function.pdf)

Vocabulary Words

pistil: female parts of a flower, including the stigma (where pollen lands), style (stalk-like part between stigma and ovary), an ovary (at the base, develops into the fruit and contains the seeds)

pollenizer: plant that provides pollen

pollinator: agent that moves pollen resulting in the pollination of flowers

stamen: male parts of a flower, including the anther (produces and contains pollen) and filament (stalk supporting the anther

Did You Know? (Ag Facts)

- About one-third of the total human diet is derived directly or indirectly from insect-pollinated plants.
- An estimated 80% of insect crop pollination is accomplished by honey bees.
- While pumpkins and other squash are self-pollinating, they are a bit unique. The flowers on these plants are considered "incomplete" because the flowers are either male or female. The pollen-bearing male flowers contribute the pollen to the female, fruit-bearing, flowers.

Background Agricultural Connections

Gregor Mendel was a monk in the 1800s. His study of pea plants demonstrated how offspring inherit traits from parent plants. Sadly, no one seemed interested in Mendel's studies until around 1900, when three other scientists discovered similar evidenc inherited traits. Since then, researchers have continued to build on what Mendel discovered. The first activity in this lesson car serve as an introduction for teaching about inherited traits; students will dissect a flower to learn how plants reproduce, passir traits on to offspring through seeds.

To understand inherited traits in plants, you need to understand how seeds are produced. Seeds contain embryos that develop into plants. Before a plant can form a seed embryo, pollination and fertilization must occur in the flower. The reproductive orga of plants are found in the flower. The male parts of the flower include the filament, which looks like a stalk, and the anther at t top of the filament, which produces pollen grains. Pollination occurs when pollen from an anther is transferred to a stigma. The stigma is the female part of the flower that is specially developed to catch pollen grains. Below the stigma is the style. A poller grain that has been caught by the stigma reaches down the style to fertilize the egg (or eggs) in the ovary. This fertilization process creates a seed (or seeds) inside the ovary. In most cases, the ovary then swells and becomes the fruit of the plant (e. cherries, avocados, apples, cucumbers).

Many flowers contain both male and female parts. Some plants can pollinate themselves; they are self-fertile. Other plants hav chemical or physical barriers to self-pollination and need to be cross-pollinated. In cross-pollination, pollen is delivered to a flo of a different plant. Plants adapted to cross-pollinate usually have taller **stamens** (collective male parts) than **pistils** (collectiv female parts) to better spread pollen to other flowers. In self-pollination, pollen moves from the anther to the stigma of the sa flower or to another flower on the same individual plant. The seeds from self-pollinated flowers produce plants that look like th parent plant. This isn't true with cross-pollination, which yields offspring of two different parents. The offspring of cross-pollina plants may show some traits from both parents or may not resemble either parent.

Plants that cannot self-pollinate require a **pollenizer**—a separate plant to provide pollen. Even plants that can self-pollinate w often produce larger fruit and healthier offspring with a pollenizer. A good pollenizer is a plant of the same species that blooms the same time as the plant to be pollinated and provides compatible, viable, and plentiful pollen. Peaches are considered self-fertile because fruit can be produced without cross-pollination, although cross-pollination usually produces a better crop. Apple are considered self-infertile; most apple trees will not form fruit without cross-pollination by an apple tree of a different variety Pollination is critical for the production of many important agricultural crops, including corn, wheat, rice, apples, oranges, tomatoes, and squash.

In addition to planting the proper pollenizers for their crop, farmers must also consider whether their crops require a special **pollinator**. The terms pollenizer and pollinator are often confused—a pollenizer is a plant that provides pollen; a pollinator is a agent that moves pollen, whether it be wind, water, bees, bats, moths, or birds. Insects are among the most common pollinato

Many flowers grow flashy petals and produce unique smells to attract insect pollinators to their rich supplies of pollen and/or nectar (sticky, sweet liquid on the end of the stigma). These flowers trade sweet nectar and protein-rich pollen in return for th pollination service that insects perform as they move from flower to flower. Insects don't just pollinate flowers for fun; most ar collecting food.

Different insects are attracted to different types of flowers depending on color, scent, and size. Butterflies are attracted to orar yellow, pink, and blue flowers that have large landing pads. Moths are active at night, requiring flowers that are open and prov nectar at night. Large, white flowers are particularly easy for moths to find in the dark. Honey bees see colors on the higher er of the human visual spectrum, including ultraviolet, which humans cannot see. Honey bees tend to prefer blue, purple, and yellow flowers that have sweet scents.

It's common to see bee boxes in orchards because honey bees are good pollinators for many fruit crops. Once a honey bee fin an abundant source of nectar and pollen, it will return to the hive and tell other bees how to locate that source by performing dance. After a hive is placed in an orchard, it doesn't take long for a steady stream of busy bees to start buzzing from flower t flower. Honey bees have lots of little hairs on their bodies, and a furry bee moving around inside a flower picks up a lot of polle Some of this pollen will be brought back to the hive for food, but some will be deposited on the stigmas of other flowers that t bee visits, pollinating those flowers. In an orchard, lots of pollinated flowers will lead to lots of tasty fruit!

Interest Approach - Engagement

1. Ask students to brainstorm the ways we use and rely on flowers each day. Make a list on the board. Allow students to offer their ideas using their background knowledge. (They will likely think of ornamental flowers used in flower arrangements or landscaping first.)
2. As a clue to add to their brainstorm, show the video clip, Fruit Development (https://www.youtube.com/watch?v=sEwmUbzN_-g). Following the video, ask for another important way that we rely on flowers. *(food!)*

3. Ask students what other foods develop from flowers. *(nearly all fruits and vegetables.)* Conclude that many foods are developed from flowers on a plant. Explain to students that next they will be learning about the anatomy of a flower and th process of pollination.

Procedures

Activity 1: Flower Anatomy and Dissection

1. Explain that flowers contain the reproductive organs of [angiosperm] plants. Flowers produce the seeds that can be used tc produce new plants.
2. Give each student one copy of the *Flower Power: Anatomy and Function* handout. Instruct students to read the first page a then describe in their own words each of the flower parts.
3. Project the *Flower Anatomy* PowerPoint and have students label their flower diagram found on the back of their worksheet.
4. Demonstrate a flower dissection to your students using the tips from the Flower Dissection Tutorial (https://www.youtube.com/watch?v=po0O9ycGNvc).

5. Following the demonstration, give each student one copy of the *Flower Dissection Lab* sheet, one flower to dissect, and access to clear tape. Instruct students to dissect their flower and place a sample of each anatomy part in the appropriate b on their lab sheet.
6. Discuss the following comprehension questions:
   - If the flower is pollinated, can the seeds from the ovary be planted to grow more flowers? (Yes)
   - Which three parts make up the pistil, or female flower parts? *(Ovary, Style, and Stigma)*
   - Which two parts make up the stamen, or male flower parts? *(Anther and Filament)*
   - What contains the genetic material from the male? *(pollen)*
   - If the seeds from this flower were planted, would this be an example of sexual or asexual propagation? *(sexual propagation)*

Activity 2: Origami Flower Model

1. Explain to the students that they will be creating an origami flower to model the anatomy of a flower.
2. Follow the instructions on the *Origami Flower* PowerPoint to create the flower petals.
3. Each student should add the following parts to their flower:
   - The white chenille stem represents the style. Use one yellow pony bead to represent the ovary, and attach it to the bottom of the style.
   - The yellow chenille stems represent the filaments. Push the white and yellow chenille stems up through the bottom center hole of the origami flower. Trim the chenille stems to the desired length, making sure the white chenille stem is slightly taller than the yellow chenille stems.
   - Create the stigma and anthers by attaching a yellow pony bead to the top of the style and white pony beads to the tops of each filament.
   - Use green tissue paper to create the sepal. Poke a small hole into the center of the sepal with the sharp point of a pencil. Glue the sepal around the bottom of the origami flower petals.
   - Place the green chenille stem into the bottom hole of the flower. Create leaves around the stem using the green bump chenille stems.
4. Ask the students to use their flower models to point out each part of the flower and explain the parts' functions.

Activity 3: Pollination and Fruit Development

1. Using the origami flower or the flower diagram from the *Flower Anatomy* PowerPoint, illustrate and describe the process of pollination.
2. Explain that pollen is a powdery substance containing the male gamete cells for seed plants. Plants reproduce seeds and fruits only after being pollinated.
3. Watch Pollination: Trading Food for Fertilization (https://www.youtube.com/watch?v=LiczM-w3V-U). As students watch the video, have them keep a list of all the ways flowers can be pollinated. This will include a list of animals and insects as well a modes of transportation for pollen such as wind.
4. As an example, show students the video clip CUCUMBER | How Does it Grow? (https://www.youtube.com/watch?v=Ua1TbZAyqjc&list=PLv9GnIwtmHxAhT90iRqip49gGm7rNBCkU&index=3) This seven minute video clip shows the process growing cucumbers including the importance of flowers and pollination. Inform students that after the video clip they shoul be able to describe the relationship between flowers and cucumbers.
   - **Tip:** If time is short, begin the video at 3:20 and end at 6:00.

5. Ask the following questions:
   - What correlation is there between a flower and a cucumber? *(Cucumbers develop from a pollinated flower.)*
   - How many times does a cucumber flower need to be pollinated for a perfectly straight cucumber? *(seven)*
   - What type of weather does a bee prefer? *(Cool, sunny, and no rain or wind. Otherwise they tend to stay in the hive.)*

(Optional) Activity 4: The Bee Dance
This activity needs lots of room. Try it outside!

1. Ask students how humans communicate non-verbally (body language, hand signals, facial expressions). Have a few studen demonstrate in a charades-type manner.
2. Explain that bees communicate to tell one another where to go for good sources of food (nectar). Watch What's the Waggle Dance? And Why Do Honeybees Do It? (https://www.youtube.com/watch?v=LU_KD1enR3Q)

3. Review the *Honey, I'd Love To Dance* handout. Discuss both dances and what each movement means.
4. Divide the class into teams of 4–5, depending on class size. Have each team choose a scout. This student/bee will find the food source (treat bag) and communicate its whereabouts through bee dances to the team members.
5. Give each scout written directions to a different treat bag (that you have hidden), and then send the scouts out to find ther Do not let the other students witness their search.
6. When the scouts return, have them communicate the direction and distance of the treat bag to their team members using either the round dance or the waggle dance. No verbal or "human" body language allowed!
7. Once all the teams have found their reward, follow up with a class discussion about the ease or difficulty of communicating through dance. Is it difficult to judge distance without a tape measure or other tools? Do they believe honey bees are intelligent creatures?

Concept Elaboration and Evaluation

After conducting these activities, review and summarize the following key concepts:

- A flower contains the reproductive organs of a [angiosperm] plant.
- Flowers can be beautiful to look at, but some flowers develop into food that we eat. All fruits and even some vegetables develop from the flower of a plant.

- A flower must be pollinated before it will produce a fruit. This can be done by insects such as bees or by the wind.
- Pollination is important in producing our food. Pollinators like bees are one example of a natural resource used in agriculture

We welcome your feedback (https://usu.co1.qualtrics.com/jfe/form/SV_4HhIVpN4L8IC2lT)! Please take a minu to tell us how to make this lesson better or to give us a few gold stars!

Enriching Activities

- Further explore the world of bees and pollination with the video Migrant Bees (https://youtu.be/KRxCd4WKDfM)*:*

- Compare the anatomy and flower parts of Lillies, Tulips, Carnations, Roses, Hydrangeas, Gerbera Daisies, and Delphiniums b watching The Science and Biology of Flowers (https://youtu.be/HEPV6QUf7r4?t=61) (watch from 0:45-6:32).

- Give small groups of students a set of food cards (https://cdn.agclassroom.org/media/uploads/2018/08/28/Fruit_and_Veg_Cards_1.pdf). Have students sort the cards into t piles — (1) foods that come from flowers and (2) foods that do not come from flowers. Allow students to research foods as needed in the sorting process. Take it a step further by having students sort the "foods that come from flowers" pile into tw piles— (1) foods requiring insect pollination and (2) foods that do not require insect pollination. Refer to the List of Pollinate Food (https://www.pollinator.org/list-of-pollinated-food) for more information.
- Have students Match Flowers to their Pollinators (https://learn.genetics.utah.edu/content/flowers/matchflowerpollinator/) using the simulation on the Learn.Genetics website.

- View the Flower Traits Slideshow (https://learn.genetics.utah.edu/content/flowers/flowertraits/) to discover how flower trait attract pollinators.

Sources

Activity 2 and 4 were adapted from the National Honey Board's guide *The Honey Files: A Bee's Life. A Teaching Guide Grade Levels 4-6.*

Suggested Companion Resources

- Bees and Wasps (https://www.agclassroom.org/matrix/resource/247/)
- The Reason for a Flower (https://www.agclassroom.org/matrix/resource/133/)
- Origami Parts of a Flower (https://www.agclassroom.org/matrix/resource/796/)
- Anatomy of a Worker Bee (https://www.agclassroom.org/matrix/resource/323/)
- Parts of a Flower Poster (https://www.agclassroom.org/matrix/resource/801/)
- Amazing Time-Lapse: Bees Hatch Before Your Eyes (https://www.agclassroom.org/matrix/resource/925/)

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