Plant Reproduction: Soybean Style

Objectives: Students will learn about the process of plant reproduction, including pollination, by creating models of soybean flowers.

Oklahoma Academic Standards:

Science: 1.LS1.1; 2.LS2.2; 3.LS1.1

Teacher Background:

Plants have to produce offspring or they would go extinct. While some plants can reproduce asexually, most reproduce sexually meaning that a male and female gamete will combine to produce a new plant with genetic makeup shared with the parents. Most plants (85-90%) reproduce utilizing flowers. Flowers contain both male and female parts (though some may only contain one or the other. If a flower contains both parts it is considered a perfect flower. The male part of the flower is called the stamen. The stamen contains anthers (where the pollen is produced) and filaments which hold the anthers up. The male gamete (reproductive cell) is found within the pollen. The female part of the flower is called the pistil. The pistil contains stigmas, styles, and ovaries. The stigma is what collects the pollen grains and the style allows the pollen grains to pass through to the ovary, which is found at the bottom of the pistil, and contains the ovules or female gametes. When pollen lands on a flower's stigma, pollination has occurred. If this pollen is able to travel to the ovary then fertilization can occur and a new plant may be produced. The ovary turns into a fruit and the seeds are contained within. Some plants can self-pollinate (like soybeans). This occurs when pollen from the anther of a flower moves to the stigma on the same flower. Other plants require cross-pollination which is when the pollen from the anther of one flower has to travel to the stigma of another flower. Pollinators and wind are primarily responsible for moving this pollen. Plants have certain adaptations that can attract pollinators and make pollination more likely. Using a soybean craft activity, students will learn about plant reproduction and pollination.

Important Vocabulary:

Anther: produces pollen grains
Filament: supports the anther
Flowers: part of the plant that makes seeds and fruits
Fruits:protect the seeds and help the seeds get moved from place to place
Leaves: collect sunlight and make food for the plant
Ovary: produces seeds inside tiny ovules
Ovule: houses the female gamete
Pistil: the female part of a flower
Pollen: houses the male gamete
Roots: Stabilize plant and absorb water
Soybean: a widely cultivated plant of the pea family that produces edible seeds
Stamen: the male part of a flower
Stem: Moves water/nutrients throughout the plant
Stigma: collects pollen grains
Style: allows pollen to pass to the ovary

Bioenergy: *From Field to Fuel*

Materials:

- Soybean Flower Slides
- Soybean Flower Creation-Help! (optional- but helpful!)
- Duct Tape
- Yellow Pony Beads
- Silver, Gold, and Green Pipe Cleaners
- Purple and White Tissue Paper

Lesson:

1. Tell students that humans have different body parts that serve different functions and plants have different parts that serve different functions too!
    a. Ask: What plant parts do you know of? What do those parts do?

2. Explain that some parts are on the outside (external) and some are on the inside (internal), but all are important to help organisms grow, survive, and reproduce!

3. Utilize the Soybean Flower Slides (Slide 3) to review the basic plant parts and functions with students.

4. Ask students, “How do more plants grow?” Guide students in recognizing that reproduction (producing offspring) has to occur.

5. Tell students that a large portion of plants are called flowering plants and they create offspring through the combination of special cells found in the flowers of the parent plants.

6. Mention that flowers are the reproductive organ (part) of the plant and flowers have both male and female parts.
    a. Male Part: Stamen
    b. Female Part: Pistil

7. Show students the diagrams beginning on Slide 9 and support this information with any real flowers that you may have in your classroom. Practice identifying the parts.
    a. Note: You could also do a nature walk and try to find flowers, if the weather permits.

8. Explain to students that when pollen (from an anther) lands on a stigma, pollination has has happened.
    a. Ask students: “ How does pollination occur?” Accept all answers but look for things like bees, wind, animals move pollen, etc. Extend with, “why do you think animals are attracted to flowers?” Mention that scent and brightly colored flowers can attract pollinators. Also mention that some flower designs (anthers being long and sticking out of the flower) can encourage the wind to move the pollen. (Use slide 15 to help).

9. Tell students that they will now be creating a soybean flower with the materials provided. Walk them through this process (found on the next page) and aid as needed. The Soybean Flower Creation instruction slides are also helpful, and show pictures!

10. Once students have created their flowers, ask them reflection questions such as:
    a. What do you notice about your flower? Can you find the pistil? Can you find the stamen? Where would you find the pollen? What would attract a pollinator to your flower?

Possible Extensions:

- Use flour, Mac and Cheese powder, or another substance to mimic the process of pollination with your flowers.

- Have students draw their model and label all parts of their flower. Students should then explain the parts of the flower and their functions to a partner or you.

Note: Soybeans are primarily self-pollinating, but the model can still be used for students to understand the function of flower parts and the process of pollination.

Soybean Flower Craft:

Materials (per flower):

- Duct tape (1 inch piece)
- Yellow Pony Beads (6)
- Green Pipe Cleaners (4) - with one of the four cut in half
- Gold Pipe Cleaners (1 ½)- cut into halves
- Silver Pipe Cleaner (¼)
- Purple and White Tissue Paper (4- 4 inch circles)
- Scissors

Procedure:

- **Create the Stamen and Pistil**
  - Begin with the gold pipe cleaners (3 halves) and yellow pony beads (6).
  - Wrap a pony bead on each end of a pipe cleaner by sticking the pony bead through the end and twisting to secure it.
  - Hold your silver pipe cleaner (¼) straight up and wrap each of the 3 gold pipe cleaner halves around it to create the stamen and pistil.
  - Wrap the base with duct tape (about 1 inch).
- **Create The Leaves**
  - Take one of your green pipe cleaners and create a loop in the middle, twist once to secure the loop.
  - Create two additional loops and secure by twisting the pipe cleaner at the base of the original loop.
  - Repeat so that you have a total of 2 leaves.
  - Take another green pipe cleaner (cut into halves), and use each half as the stem for the leaves. To secure, twist around the center of each leaf.
- **Add the Petals and Stem**
  - Take one 4-inch tissue paper square, fold it in half, and wrap it around your stamen and pistil, pinch it around the duct-taped base.
  - Take your other 3, 4-inch tissue paper squares and stack them in an offset manner. Use you scissors to make a small slit in each one.
  - Slide your stamen and pistil through the slits so that the duct-taped base is beneath the petals, then pinch all tissue paper. To secure, take one more green pipe cleaner and begin to wrap it around the base and tissue paper to hold it. This will serve as your stem.
- **Complete Your Flower!**
  - After wrapping the green pipe cleaner around the stamen and pistil base, use the remainder of the pipe cleaner to attach your leaves to. Do this by twisting the pipe cleaners onto each other.

Information Sources:

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Image Sources:

Soybean Emergence: Image by Julio César García from Pixabay

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