

Plants Around Us

STEM Pillars

Informal Audience

Families with children aged 6–10 years old (K—5th grade).

Content Goal

Flowers and pollinators have an important relationship that helps to produce more flowers.

Practice Goal

Observe the parts of a flower to understand the relationship between plants and pollinators.

Affinity Goal

Plants and pollinators are important to me, my family, and my community.

Driving Question

How do flowers help pollinators and how do pollinators help flowers?

Teaching Style

Narrative, free-form exploration, driving question, content, and exploration of the driving question.



Plants Around Us: Summary

Families work together to dissect two flowers in order to learn about the different components of a flower, and design a flower to attract a pollinator of their choice in order to learn about the pollination process.

The workshop is for children and adults working together. The curriculum is written to be facilitated by botanists, plant ecologists, farmers and extension agents in the community.



Talk supports learning!

Look for **blue family-focused prompts** throughout this curriculum. Our team has developed questions to encourage families to talk together at their tables.

Think-pair-share strategy: The question format is for you to ask questions about which families can **think** together and then interact (**pair**) with each other before being asked to **share** their ideas with the group.

For example, you can begin a family prompt by saying, “**Take a moment to discuss with your family**”

When you see these prompts, **give the families 2–3 minutes to talk**. Then, you can ask for a volunteer to share their ideas with the larger group.

If families are engaged in conversation, you are helping them **make connections to science**. This family talk time will increase learning outcomes and affinity toward plants and pollination!

Teaching with Project-based Learning

This workshop curriculum was designed with the **project-based learning teaching strategy** for parents and children working together. This means each workshop includes teaching strategies that are NOT lecture-based. Instead, you will facilitate families to:

- ♦ engage in **free-form exploration** with scientific tools, concepts, and ideas related to plants and pollination
- ♦ work toward answering a **driving question** that transforms early free-form exploration into a developmentally-appropriate version of the work that a scientist does
- ♦ collaborate in scientific work that creates a **product to share with others**.

Project-based learning is a **learner-centered** teaching strategy. When you teach with the project-based learning teaching strategy, you do not deliver a lecture to the whole group; instead, you encourage the working teams to talk together. You provide less content at the start to build learners' prior knowledge of the topic in order to encourage discovery. Because you are empowering small teams (families, in our case) to work, think, and talk together, you provide content after the learners have explored the tools together — rather than providing all content at the start of the workshop. By using project-based learning, we intend to give families a collaborative style of doing science together that they can continue to use in other settings, such as **museums, libraries, homes, and parks**.



Plants Around Us: Overview

Project-based Learning Phase 1: Exploration

- ♦ Tell a story about how you became interested in plants and pollinators and your field of science.

Family Prompt 1: Take a few minutes to discuss with your family: What types of plants do you have in your yard or in your neighborhood?

- ♦ Ask families to observe a flower.

Family Prompt 2: With your family, think about the flower that you observed. What colors did you notice? What parts of the flower have bright colors?

Project-based Learning Phase 2: Driving Question and Plants Content

- ♦ Driving Question: **How do flowers help pollinators and how do pollinators help flowers?**
- ♦ Content: Introduce botany profession and how botanists observe plants through dissection.

Project-based Learning Phase 3: Biological Observation through Flower Dissection and Design

- ♦ Simple Flower Dissection: Families will investigate a simple flower.

Family Prompt 3: With your family, take a few minutes to share with each other the different parts of the simple flower you were able to identify.

- ♦ Compound Flower Dissection: Families will investigate a compound flower.

Family Prompt 4: Discuss with your family: What was something that was the same between your first flower and this second flower? Different?

- ♦ Introduce relationship between plants and pollinators.

Family Prompt 5: Take a few minutes to discuss with your family: What kinds of animals or insects do you see visiting flowers around your home or community?

- ♦ Design a flower: Families will design a new flower for a specific pollinator.

Project-based Learning Phase 4: Share

- ♦ Share: Have families share the flower they designed for their assigned pollinator.
- ♦ Wrap-up: Re-address the driving question: **How do flowers help pollinators and how do pollinators help flowers?**

Plants Around Us: Curriculum

Project-based Learning Phase 1: Exploration

♦ Start the workshop.

- Begin by introducing yourself and welcoming the families to the workshop.
- Tell a story about how you became interested in plants and pollinators and your field of science.

♦ After introductions, ask:

Family Prompt 1: Take a few minutes to discuss with your family: What types of plants do you have in your yard or in your neighborhood?

Facilitation Tip: Provide a few minutes for families to talk. This may feel like a long time, but you are facilitating families making connections.

♦ Ask families to observe a flower.

- Distribute one flower to each family.
- Say, “Please take a few minutes working together to observe this flower. What do you see?”
- After a few minutes of within-family observation, ask:

Family Prompt 2: With your family, think about the flower that you observed. What colors did you notice? What parts of the flower have bright colors?

- After families talk for a few minutes, engage in a whole-group discussion so families can share what they noticed.



Project-based learning Phase 2: Driving Question and Content

- ♦ **Introduce the driving question:** **How do flowers help pollinators and how do pollinators help flowers?**

Facilitation Tip: Make sure that the driving question poster is clearly visible to all families. You may want to refer back to this poster and driving question throughout the workshop.

- ♦ **Introduce botany and the concept of native plants.**

- Explain that botanists are scientists who study plants.

Facilitation Tip: If you have a different expertise—say you are a farmer or an ecologist—please also explain what your profession does and how it relates to plants and pollinators!

- Say, “Native plants are important to our local environment because they are best adapted to the local growing season, climate, and soils. They usually require less care, meaning less money, water, and time.”

- ♦ **Introduce concept of dissection.**

- Say, “To understand the relationship between flowers and pollinators, we need to understand what the inside of a flower looks like and what those different pieces do. We’re going to do this through flower dissection, or taking the flower apart so we can look at all of its parts.”

Project-based Learning Phase 3: Biological Observation through Flower Dissection and Design

- ♦ **Introduce simple flower dissection.**

- Hand out laminated flower diagrams and **simple** flower specimens (each **individual** should get a flower).
- Families will **investigate** the inside of a **simple** flower by working together to dissect a **simple** flower using tweezers, tape, card stock paper, and two laminated diagrams of flowers.
- Provide the following instructions:
 1. Gently pull the flower apart using your tweezers.
 2. See how many different parts of a flower you can find as you begin to take your flower apart.
 3. Tape the different pieces of the flower to the paper. If you know what that part of the flower is called, you can label it.
 4. If you don’t know all the parts of the flower (or any), use the flower diagram on your table to label the flower parts.
- Let families know that they will discuss the flower parts as a group after this activity is completed.

Facilitation Tip: Mingle among families while they are dissecting their flowers to answer their questions and importantly, to encourage them!

- Once families appear to be wrapping up their dissection, say:

Family Prompt 3: With your family, take a few minutes to share with each other the different parts of the simple flower you were able to identify.

- After families talk for a few minutes, engage in a whole-group discussion so families can share about the parts of the flower they were able to identify.

Facilitation Tip: You may need to use an attention-getting technique to get the families to focus on you after this first dissection. Examples include saying loudly, “one-two-three, eyes on me!,” clapping, or ringing a bell.

♦ **Use the families’ answers as jumping off points for labeling the different parts of a flower.**

- Orient the discussion in order to cover the seven basic parts of a flower (below) and hold up laminated flower photos to help families visualize these different parts:

- Stem/Peduncle** - the part of the flower that supports and holds the plant upright and stable. Did you notice that your stem was hollow like a straw? This allows the plant to transport water and nutrients from the roots and leaves.
- Petal** - the bright parts of the flower that attract insects and other pollinators.
- Sepal** - the part of the flower that protects the flower before it has bloomed. When the flower is in bloom, the sepals are found underneath the petal. They’re often green, but occasionally, they are the same color as the petal, which makes it tricky.
- Stamen** - this is the “male” part of the flower that provides support for the anther.
- Pistil** - this makes up the entire “female” part of the flower that allows pollen to travel down through to the ovaries.
- Anther** - this is where the pollen is produced in the flower. Did anyone find any pollen on their flower?
- Pollen** - the powdery substance released by the anthers. Sometimes you can spot pollinators flying around with this yellow, or orange substance on their legs.

Facilitation Tip: If a family member shares that they labeled petals correctly on their paper, you can elaborate on this observation: *“Yes! Petals are the bright parts of the flower that attract insects and other pollinators!”*

♦ **Introduce compound flower dissection.**

- Say, “Now that you have a basic understanding of how a simple flower is made up, you are starting to become botanists! Now we are going to test your botany skills with the next challenge: dissecting a compound flower!”
- Hand out laminated flower diagrams and compound flower specimens (each individual should get a flower).
- Families will **investigate** the inside of a **compound** flower by working together to dissect a **compound** flower using tweezers, tape, card stock paper, and two laminated diagrams of flowers.
- Remind families of the instructions from the previous activity (see p. 5).

- Once families appear to be wrapping up their dissection, ask:

Family Prompt 4: Discuss with your family: What was the same between your first (simple) flower and this second (compound) flower? What was different?

- After families talk for a few minutes, engage in a whole-group discussion so families can share the similarities and differences that they noticed.

♦ **Provide content on compound flowers.**

- Refer to the laminated picture of a dandelion.
- Say, "This looks different from the simple flower! It almost looks like there are many tiny individual flowers within the head of this flower. Actually, all of the parts that we learned about in the simple flower are also found in this flower, they just look a bit different!"
- "Notice that there is still a stamen and anther that we can see easily. There are a lot of them! What's harder to find are the pistils because they are deeper inside of the compound flower."

♦ **Introduce the relationship between pollinators and flowers.**

- Say, "We've all just taken a peek into the inner workings of a flower! We're now going to transition into our last activity to think about how pollinators interact with flowers, and how they both work together to survive."
- Then ask:

Family Prompt 5: Take a few minutes to discuss with your family: What kinds of animals or insects do you see visiting flowers around your house or community?

- After families talk for a few minutes, engage in a whole-group discussion so families can share what they discussed.
- Refer to the laminated photo of a bee on a flower.
- Say, "Did anyone see any pollen on or in your flower as you were taking it apart? It looks like a dark orange/yellow powder. When animals like butterflies, bees, and hummingbirds go to flowers to drink the nectar (which is at the very bottom of a flower), they get pollen stuck on themselves. They will then take that pollen to the next flower. This helps other flowers grow."

♦ **Introduce design-your-own-flower activity.**

- Distribute pollinator-specific cards to the families (one per family).
- Explain to families that they will look at the description of their flower (color, shape, and smell) and the type of pollinator that would be attracted to this flower. They will use that information to draw what they think their flower would look like using the provided paper and coloring supplies.

Facilitation Tip: During this time, mingle around the room checking in with families about their drawings.

Project-based Learning Phase 4: Share

♦ **Ask families to share the flower they designed for their assigned pollinator.**

Facilitation Tip: Encourage other families to support each other by applauding after each flower presentation. Use the presenter's name (taken from their name tag) to create a nice community-oriented feeling in the group.

♦ **Wrap up the workshop.**

- Re-address the driving question: **How do flowers help pollinators and how do pollinators help flowers?**
- Encourage families to continue exploring their backyards and neighborhoods for plants and pollinators throughout the year. Suggest planting pollinator-friendly plants in their yard or garden if possible.

End of Workshop

Acknowledgments

Curriculum ideas were developed by Dr. Lucy McClain, Dr. Heather Zimmerman, Emily Daigle, Torri Withrow, Zachary McKinley, and Katharine Grills.

Images were collected by staff at Shaver's Creek Environmental Center (shaverscreek.org) and by STEM Pillars graduate students and staff.



This project was made possible in part by the Institute of Museum and Library Services.

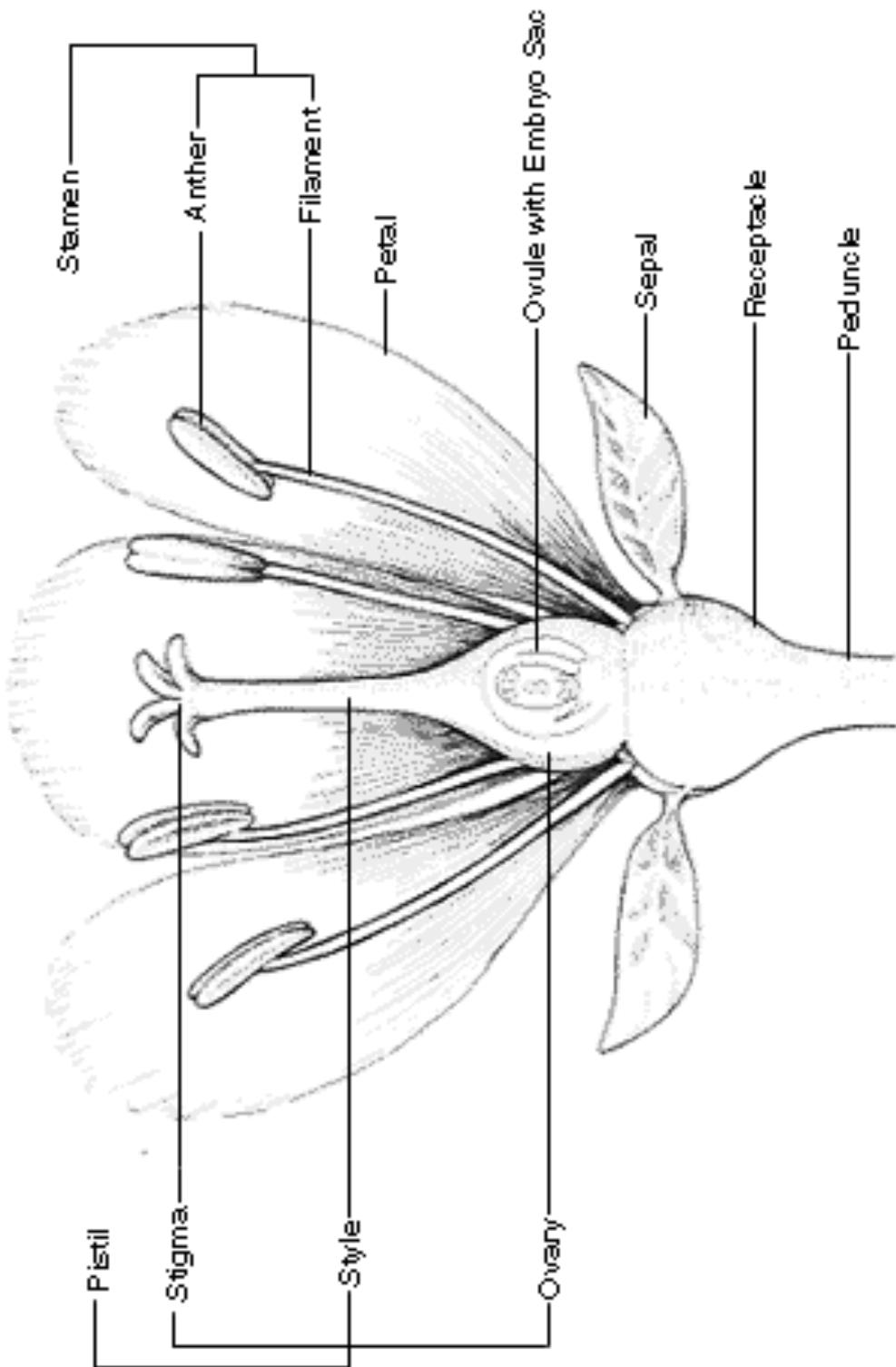
**For more information, contact:
STEMPillars@gmail.com or heather@psu.edu.**

Appendix

Plants Around Us: Materials

- Driving question poster
- Laminated photos of flowers (6 total, including simple flowers and compound flowers)
- Laminated photo of a bee pollinating a flower
- Laminated simple flower diagram
- Laminated compound flower diagram
- Clear tape
- Card stock paper
- Tweezers (1 per family)
- Scissors (1 per family)
- Crayons/colored pencils
- Simple flowers (e.g., tulip, hibiscus, lily, iris)
- Compound flowers (e.g., Dianthus/sweet William, dandelion, daisy, snapdragon, rose, etc.)
- Pollinator specific card (e.g., bees, bats, hummingbirds, etc.; 1 per family)
- Name tags for workshop attendees and facilitator (optional)

Simple Flower Diagram



Compound Flower Diagram

Examples of Compound Flowers:

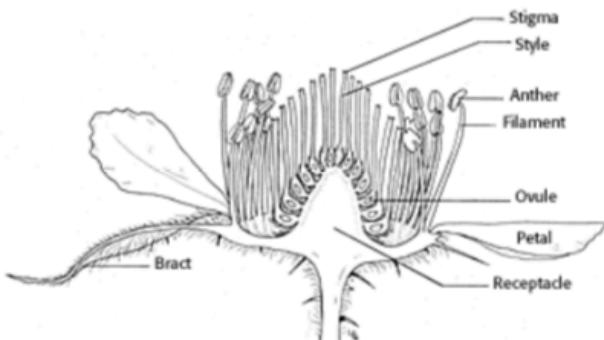
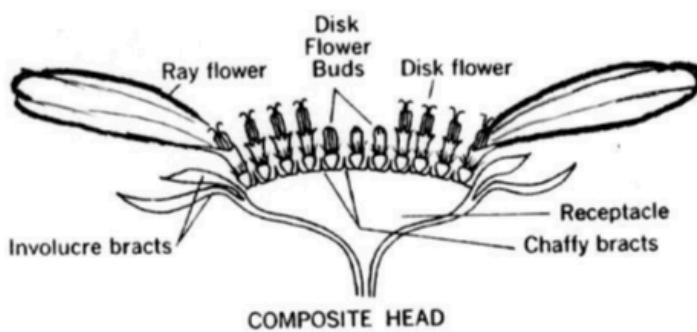
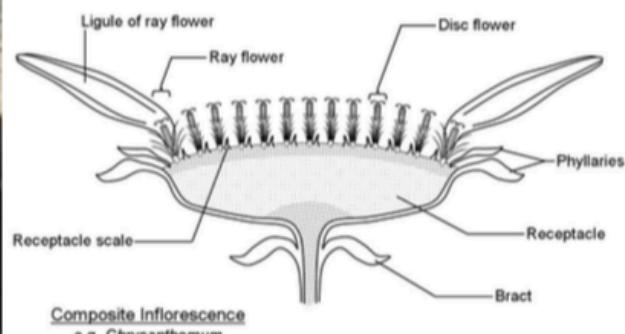


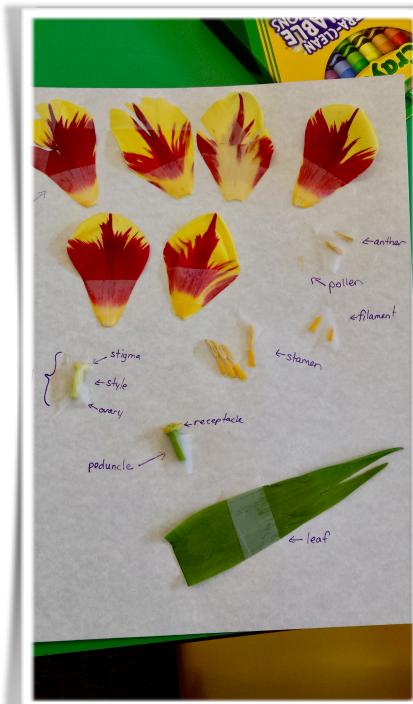
Figure 167. - Longitudinal section of 'Williamette' raspberry flower, x10.



Sample Projects



Flower dissection diagram created by a family during the plants workshop with parts grouped together in the shape of the flower.



Additional flower dissection diagram with flower parts separated and labeled.



Imagined flower created by a child to attract a bat.



Imagined flower created by a child to attract bees.

Acknowledgments



This project was made possible in part by the Institute of Museum and Library Services.

**For more information, contact:
STEMPillars@gmail.com or heather@psu.edu.**