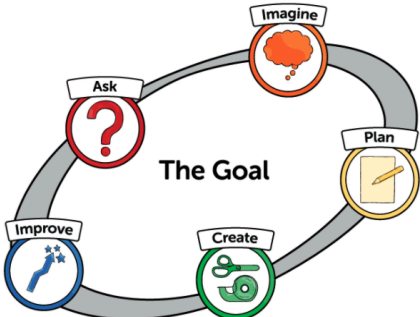


Unit 4: The Power of Pollinators

WEEK 7 Lesson 1

Science and Engineering
Designing Hand Pollinators

Big Idea	Pollination is a result of animal behavior.
Guiding Question	How does pollination happen?
Content Objective	I can apply my knowledge about properties of materials to design a hand pollinator for a specific kind of flower. (2-PS1-1, Practice 1)
Language Objective	I can talk with my partner about which materials are best for the design of a hand pollinator. (SL.1.2)
Vocabulary	constraint: limitation
Materials and Preparation	<p>Beginning with this lesson, children re-embark on a design challenge, guided, as in Unit 3, by the Engineering is Elementary (EiE) Engineering Design Process. If needed, review the EiE website. (https://www.eie.org/overview/engineering-design-process). The following graphic summarizes the Engineering Design Process steps and will be recreated on a chart during the lessons. (A free poster of this graphic can be downloaded from the EiE website.)</p> <div style="display: flex; align-items: flex-start;"> <div style="flex: 1;">  </div> <div style="flex: 2; padding-left: 20px;"> <p>ASK: What is the problem? How have others approached it? What are the constraints?</p> <p>IMAGINE: What are some solutions? Brainstorm ideas. Choose the best one.</p> <p>PLAN: Draw a diagram. Make lists of needed materials.</p> <p>CREATE: Follow the plan and create something. Test it out.</p> <p>IMPROVE: What works? What doesn't? What could work better? Modify the design to make it better. Test it out.</p> </div> </div>

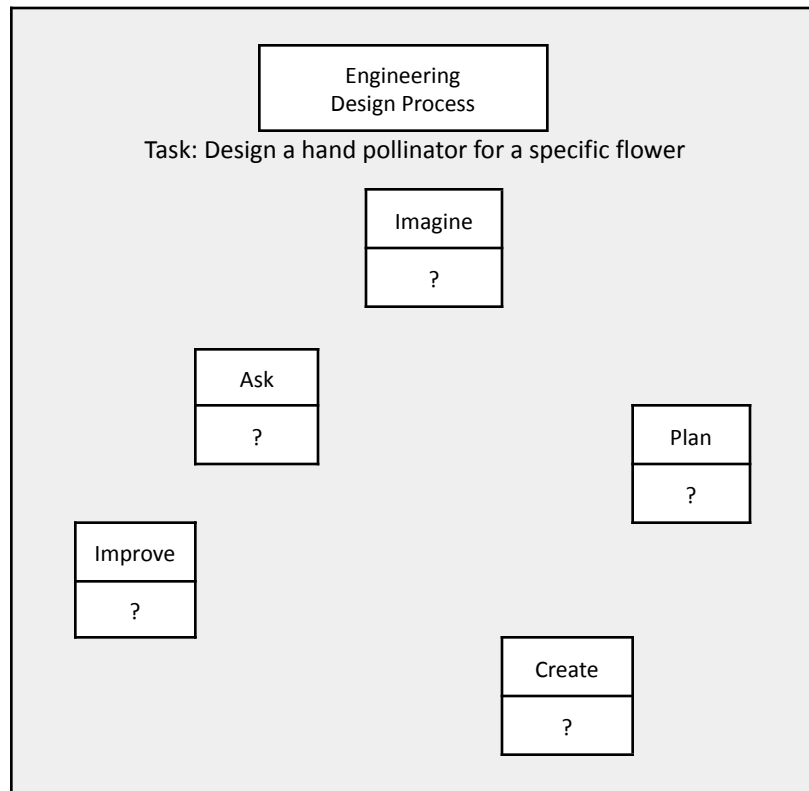
- **Model Flower Structures Background Information and Assembly Instructions**

Assemble the model flowers according to the instructions provided, making one model for each pair of children. Before doing so, review each of the model flowers to inform assignments of particular flowers to particular pairs of children. Note that the poppy will be the easiest flower for which to design a hand pollinator, and the bucket orchid the most difficult. Materials are provided for only two pairs of children to work on the bucket orchid.

- glue stick or tape
- chart paper
- Engineering Design Process cards, cut apart
- Design Process Questions, cut apart

As in Unit 3, create a chart like the one below by attaching the Engineering Design Process title card at the center top of the chart paper. Below this write, Task: Design a hand pollinator for a specific flower.

Then, add the Engineering Design Process cards with corresponding Design Process Questions below each. Draw arrows from one step to the next. (Alternatively, use the EiE poster linked above.)



	<ul style="list-style-type: none"> ● Evaluating Materials for Hand Pollinators chart, from Week 6 ● Flower Models: Bucket Orchid, Dutchman’s Pipe, Jack in the Pulpit, and Poppy ● Science and Engineering packets ● writing and drawing tools <p>Add to each pair’s collection of materials from Week 6:</p> <ul style="list-style-type: none"> ● selected model flower ● 1 craft stick ● 1 straw ● 1 piece of floral wire, 6” long ● 1 piece of string, 6” long <p>If needed, replace the aluminum foil or waxed paper squares.</p>
Note	<p>Looking at the yellow lady’s slipper is helpful in imagining how the bucket orchid is pollinated. Watch: Yellow Lady’s Slipper with Two Potential Pollinators (https://www.youtube.com/watch?v=hys7JPJnv8w) (1:16) Read: “Yellow Lady’s Slipper - Like Winning the Lottery” (https://the-natural-web.org/tag/yellow-ladys-slipper/)</p>
Opening 10 minutes	<p><i>Last week you explored the properties of materials to identify which are most effective for picking up and depositing pollen. This week you will use that information to begin designing hand pollinators.</i></p> <p><i>What do you remember about why farmers and gardeners might need to use hand pollinators?</i></p> <p>Support children’s recall. Refer to the video from Week 6, “Disappearance of the Bees: What’s the Impact?” [Flowers need pollinators in order to reproduce and form seeds; in some places pollinators are disappearing or the right kind of pollinator does not live in that area. When that happens, people need to design hand pollinators.]</p> <p><i>You will work with a partner, and together you’ll receive a model of a flower that needs to be hand pollinated. Your job is to design a hand pollinator for that particular species of flower.</i></p> <p><i>The flowers you will work with don’t all have the same structures; they have pollen in different places. In some flowers the pollen is easy to find, while in others the pollen is difficult to see or access. Along with thinking about materials that will pick up and deposit pollen, you will also need to consider the handle of the hand pollinator. For each flower, depending on where the pollen is, it might be different.</i></p> <p>Show the four model flowers and indicate where the pollen is located in</p>

	<p>each (see background information).</p> <p><i>Instead of real flowers, we'll use models to do this work, just like we did last week. Models are helpful because they allow us to try out different ideas and designs without damaging the real flowers if our designs do not work properly at first. The structure of the flower you are using is a constraint in your design work—it's something that cannot be changed.</i></p> <p><i>We used the Engineering Design Process for the Our Neighborhood Project exhibit. We'll use that process again now to help design hand pollinators. This time we'll use each step a bit more carefully.</i></p> <p>Refer to the chart and review the steps.</p> <p><i>Today, in pairs, you'll just begin with the Ask part of the Engineering Design Process. Ask yourselves: What is the problem? What are the constraints—the things we cannot change for our design? The materials available are the ones in your collections. Availability of materials is an important constraint!</i></p> <p>Distribute packets and materials, and send children to work.</p>
<p>Investigation 10 minutes</p>	<p>Guided by the “Ask” page of your science and engineering packet, children work in pairs to analyze their model flower. Note the different parts of the flower and where the pollen is located. Have children draw a detailed picture of their flower model and their flower, labeling all the parts they will need to consider for their design. Have them identify materials that could be useful for a hand pollinator for their particular flower structure, and consider how they will test their designs.</p> <p>Once they have decided on and recorded their initial ideas, have pairs of children working with the same model get together to compare ideas.</p> <p>At clean up, children should collect and organize materials for use in future lessons.</p>
<p>Discussion 5 minutes</p>	<p>Bring the children back to the whole group.</p> <p>Ask children, in pairs or flower-specific groups, to share the type of flower they will be working with, the location of the pollen, and the materials they will test. Encourage children to justify why they chose particular materials.</p>
<p>Closing</p>	<p><i>Today you engaged in the first step of the design process: Ask. You asked yourselves some questions and came up with some possible ideas for designing your hand pollinators. Tomorrow you will move</i></p>

	<i>to Imagine and Plan.</i>
Standards and Practices	<p>SL.1.2 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.</p> <p>2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.</p> <p>2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.</p>
Ongoing assessment	<p>Reflect on the class discussions.</p> <p>Do children apply knowledge about properties of available materials to their designs?</p> <p>Do children consider the constraints of flower structures when selecting the materials?</p>

Notes