

PROJECT ENGINEER: _____

My name is _____. I am _____ years
old. I'm in the _____ grade. My passion is
_____.

My dream is to invent something that will _____
_____. I will make a difference in other people's
lives.

Name: _____

Date: _____

2.ETS.1- Engineering and design: I can ask questions, make observations and gather information about pollination.

Guiding Questions:

1. Why are bees important?
2. What do you know about pollination?

KWL Chart

What I Know (K)	What I Want to Know (W)	What I Learned (L)

--	--	--

Name: _____

Date: _____

ASK! ASK!

2.ETS.1- Engineering and design: I can ask questions, make observations and gather information about pollination.

Directions: Draw and label the pollinators you observe. Complete the tally chart and conclusion below.

Tally Chart		
Pollinators	Times Observed in Tally Marks	Total

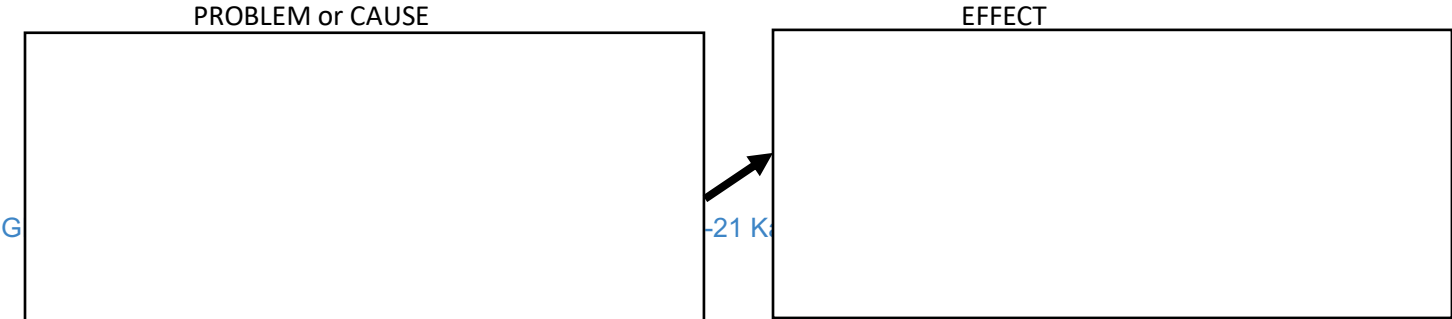
What problem did you notice? _____

How should we fix this problem?_____

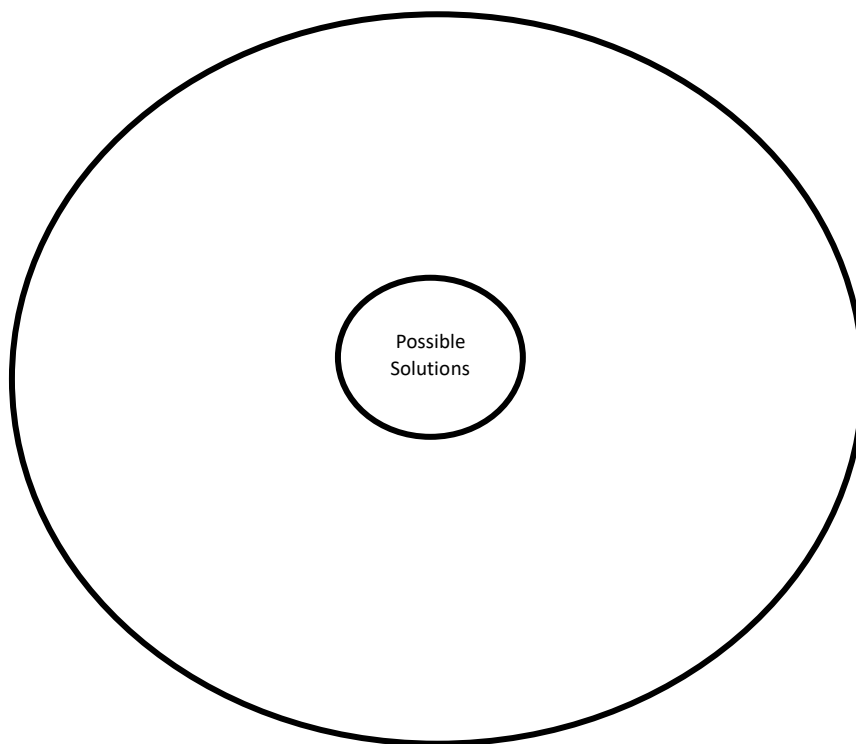
Name: _____ Date: _____

ASK! ASK!

2.ETS.1- Engineering and design: I can ask questions, make observations and gather information about pollination. Based on your findings from Kalo Park, what was the problem and the effect from having that problem?



BRAINSTORM
Possible Solutions



Specifications (Our solution should...)	
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>

CONCLUSION: Second grade students will design a _____

that can _____ to _____

Problem Statement

Name: _____

Date: _____

ASK! ASK!: Building background

RI.2.2: We are learning to Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.

Flowers Go Bats!

Visit a flower garden on a bright summer day. You will see bees and butterflies flying from flower to flower. These insects carry pollen from one flower to another. Flowers need this pollen to make seeds. The flowers attract insects with sweet smells and sweet sugar water called nectar.

Visit the Arizona desert on a warm spring night, and you will see something very different. The giant Saguaro cactus grows in the Sonoran Desert. In springtime, the white flowers of this cactus open for a single night.

At night, bees and butterflies are sleeping. But bats are awake—and they like sweet nectar, too. To get nectar, bats push their heads deep into the cactus flowers. Pollen falls on the bat's hairy head. When the bat flies to another flower, it carries the pollen with it. All night long, bats fly from cactus flower to cactus flower.

By moving pollen from flower to flower, bats help the Saguaro cactus make seeds. And that's good for all the animals in the desert. Hawks perch and nest on Saguaro cactus plants. Smaller birds nest in holes in the giant cactuses' stem. Bats and birds also eat the fruit of this cactus.

The flowers of the Saguaro cactus aren't the only ones that bats visit. If you like bananas, you should thank the bats. Bananas —and more than 500 other kinds of fruit plants—count on bats to move pollen from flower to flower.

Name: _____

Date: _____

ASK! ASK!: Building background

RI.2.2: We are learning to Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.

Directions: Create a Tree Map that identifies the main topic of this paragraph and the supporting key details that support the main topic.

Name: _____

PLAN: Gantt Chart- TEAM CHECKLIST

Start Date: _____

Steps	Period	Week 1	Week 2	Week 3	Week 4
ASK	Science	<ul style="list-style-type: none">■ Mystery Science video- Part 1 and complete K of the KWL chart■ Kalo Park pollinator observation■ Define the problem■ Review and teach vocabulary			

		<input type="checkbox"/> Watch the Mystery Science video- Part 2 and complete W and L of the KWL chart			
	Reading	<input type="checkbox"/> RI.2.2 Main topic- "Flowers Go Bats!" Article on bats and pollination			
IMAGINE/ PLAN	Science	<input type="checkbox"/> Watch the Mystery Science video- Part 3-5 and complete W and L of the KWL chart	<input type="checkbox"/> Review Gantt Chart <input type="checkbox"/> Individual Designs *Partner 1 &2 <input type="checkbox"/> Decide on a design using the Pugh Chart and through collaborative conversations		
PLAN/ CREATE	Math Science		<input type="checkbox"/> Calculate and purchase supplies to create pollinator	<input type="checkbox"/> Prototype 1 <input type="checkbox"/> Test <input type="checkbox"/> Score and Reflect	
IMPROVE	Science			<input type="checkbox"/> Revise <input type="checkbox"/> Prototype 2 <input type="checkbox"/> Test <input type="checkbox"/> Score and Reflect	
COMMUNICATION CLASS PRESENTATION	Science			<input type="checkbox"/> Post Assessment *Add more to the L portion of the KWL chart	<input type="checkbox"/> Teams present at the Curriculum Fair and test their handheld pollinators at Kalo Park

Name: _____

Date: _____

PLAN!

***2.ETS.2- Engineering and design: I can develop a simple sketch, drawing, or physical model of a pollinator.**

Problem Statement- Grade 2 students need to **design and build a handheld pollinator** to transfer pollen from one flower to another to help the declining bee population.

Criteria: *The handheld pollinator should transfer some pollen from one flower to another and be reusable.

Directions: Make a diagram and label the parts of your handheld pollinator. Rate your plan. Then, collaborate with your partner to choose the best design based on the rubric below.

Design # _____ (remember to label parts)

I designed my instrument this way because _____

Pugh Chart

1 Emerging Ready to Go	2 Developing Taking Off	3 Meeting Flying High
<input type="checkbox"/> I can develop a simple sketch, drawing, or physical model of a pollinator.	<input type="checkbox"/> I can sometimes develop a simple sketch, drawing, or physical model of a pollinator.	<input type="checkbox"/> I can not develop a simple sketch, drawing, or physical model of a pollinator.

My collaborative consultant and I chose design ☐ 1 ☐ 2 because

Name: _____

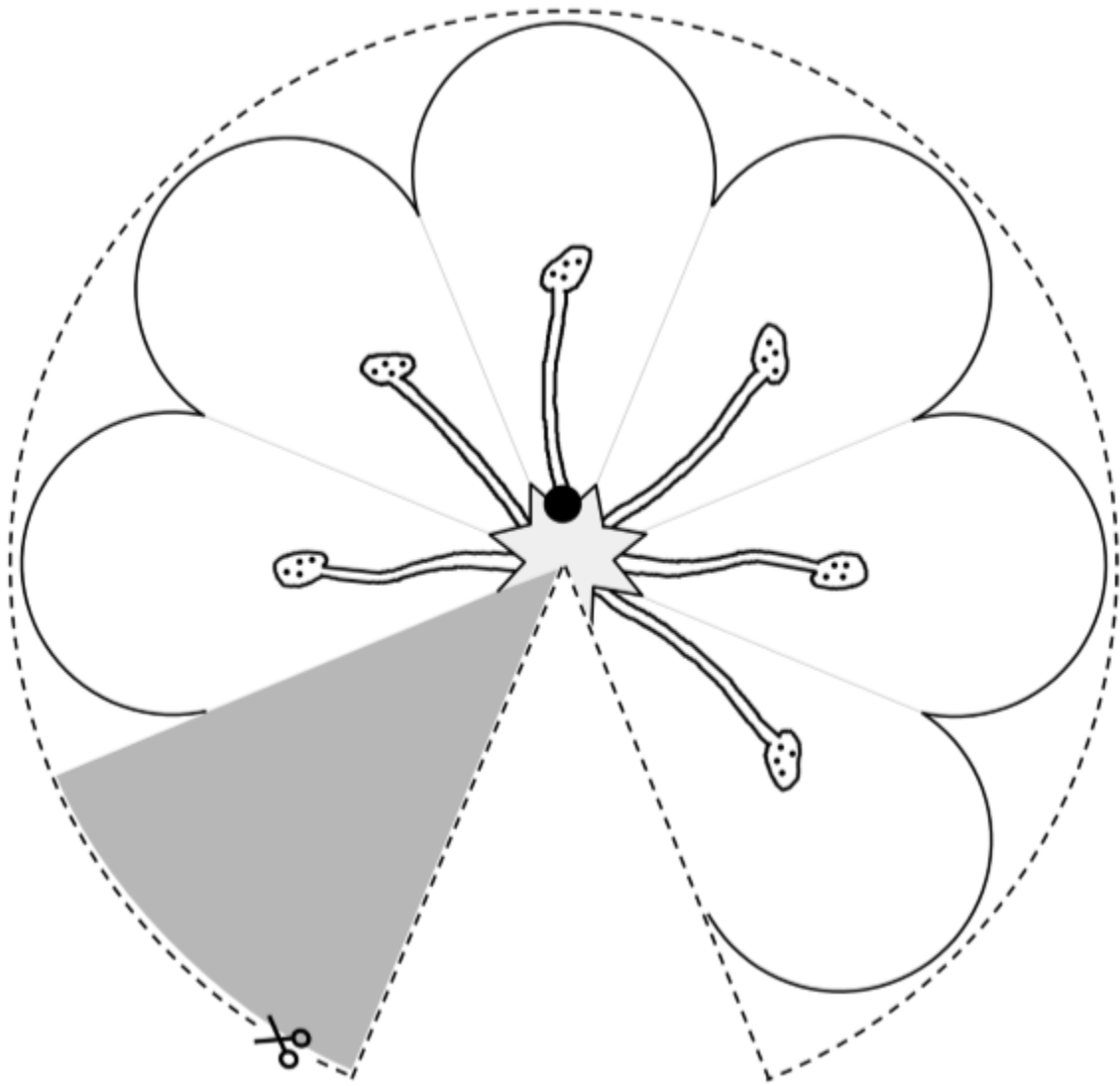
Date: _____

CREATE!

(adapted from EiE Boston Engineering Kit)

*2.ETS.3- Engineering and design: I can analyze my pollinator's ability to collect pollen and explain what did and did not work well.

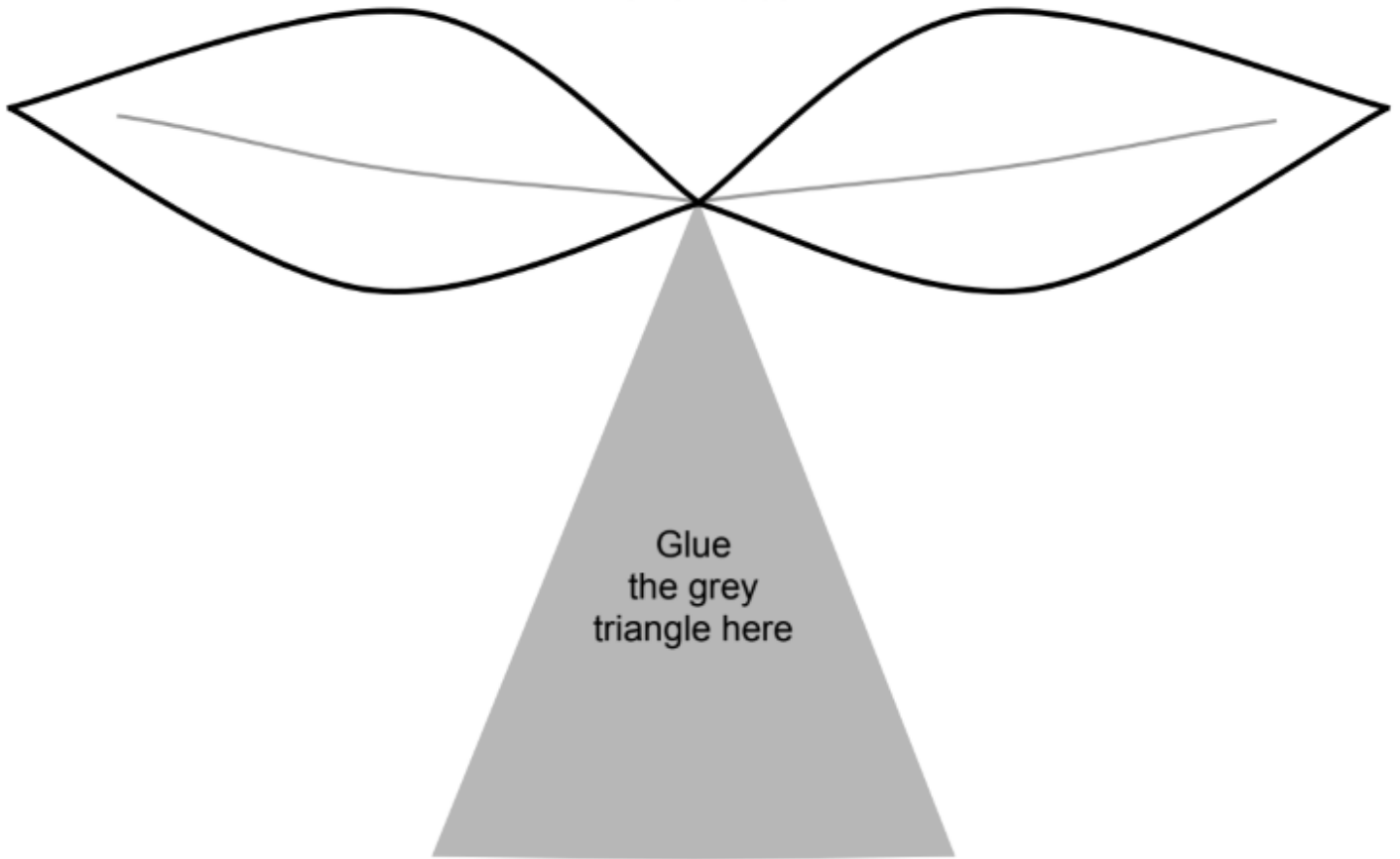
Directions: 1) Create your flower using the cut out prints below with your partner and 2) Design your first handheld prototype using the materials provided by your teacher.



CREATE!

(adapted from EiE Boston Engineering Kit)

Flower Base



Name: _____

Date: _____

PLAN!

(Refer to EiE Boston Engineering Kit)

*2.NBT.B.5- Math: I can fluently add within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

Name: _____ Date: _____

**Hand Pollinator Materials
Price List**

1 pompom.....	\$1.00
1 pipe cleaner.....	\$1.00
1 eraser.....	\$1.00
6" (15 cm) of tape.....	\$0.50
1 marble.....	\$0.50
2" x 2" (5 x 5 cm) square of foil.....	\$1.00
1 craft stick.....	\$0.75
1 plastic drinking straw.....	\$0.75
6" (15 cm) of wire.....	\$0.75
6" (15 cm) of string.....	\$0.75

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4-15

Lesson 4: Designing a Hand Pollinator

Name: _____ Date: _____

Hand Pollinator Cost

Directions: Using the table below, calculate how much your hand pollinator will cost to build.

Material	Cost per Unit	Units Needed	Total Cost
Example: pompom	\$1.00	1	$\$1.00 \times 1 = \1.00
Total Cost =			_____

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Lesson 4: Designing a Hand Pollinator

Name: _____

Date: _____

PLAN!

*2.ETS.2- Engineering and design: I can develop a simple sketch, drawing, or physical model of a pollinator.

*2.ETS.3- Engineering and design: I can analyze my pollinator's ability to collect pollen and explain what did and did not work well.

CREATE and TEST PROTOTYPE #1

This is where you record observations of your design and what happened when you tested your design. REMEMBER that success is built on failure sometimes. You will have a chance to improve or change your design, and try it again.

Create Prototype #1

Sketch, label, and color prototype #1 BEFORE collecting pollen.	Sketch, label, and color prototype #1 AFTER collecting pollen
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Collect Data (refer to data sheet from EiE Boston Engineering Kit)

Reflect

1. What worked well and why? _____

2. What part of the design do you need to improve upon and why? _____

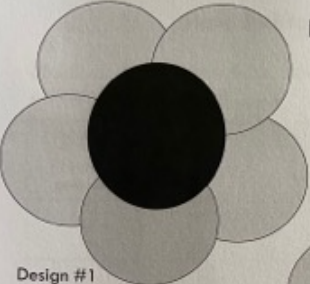
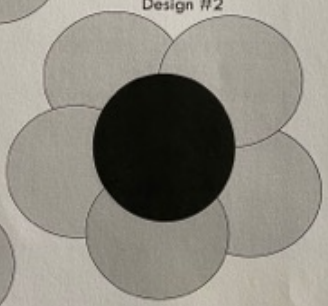
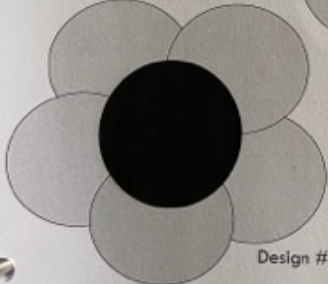

COOPERATION: ☐ I worked well with my partner.
☐ I did not work well with a partner.

Name: _____

Date: _____

Data Collection: Prototype #1

(refer to EiE Boston Engineering Kit Data Sheet)

<p>Name: _____ Date: _____</p> <div style="text-align: right; border: 1px solid black; padding: 2px; width: 30px; float: right;">A B</div> <div style="clear: both;"></div> <h3 style="text-align: center;">Flowers for Testing Hand Pollinator Designs</h3> <div style="text-align: center;"><p>Design #1</p></div> <div style="text-align: center;"><p>Design #2</p></div> <div style="text-align: center;"><p>Design #3</p></div> <p><small>EiE: Designing Hand Pollinators © Museum of Science, Boston Duplication Permitted</small> 4-13 Lesson 4: Designing a Hand Pollinator</p>	<p>Name: _____ Date: _____</p> <div style="text-align: right; border: 1px solid black; padding: 2px; width: 30px; float: right;">A B</div> <div style="clear: both;"></div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"><p>Design # _____</p><h3 style="text-align: center;">Designing a Hand Pollinator Engineering Design Process: Create!</h3></div> <ol style="list-style-type: none">1. Did your hand pollinator pick up pollen? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">YesNo</div>2. How much pollen did it pick up? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">A lotA little bitNone</div>3. Did your hand pollinator drop off pollen? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">YesNo</div>4. How much pollen did it drop off? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">A lotA little bitNone</div>5. What parts of your hand pollinator worked well? How do you know? _____ _____ _____6. What parts of your hand pollinator did not work well? Why not? _____ _____ _____ <p><small>EiE: Designing Hand Pollinators © Museum of Science, Boston Duplication Permitted</small> 4-7 Lesson 4: Designing a Hand Pollinator</p>
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Name: _____

Date: _____

2.ETS.3- Engineering and design: I can analyze my pollinator's ability to collect pollen and explain what did and did not work well.

IMPROVE!

Directions: Sketch your improved prototype #2 design. Write about the changes you will make to your design. Then, show your plan to the project manager.

Sketch, color, and label your design.	Write about the changes to your design and why you changed it.

CREATE and TEST PROTOTYPE #2

Prototype #2

Sketch, label, and color prototype #2 BEFORE collecting pollen.	Sketch, label, and color prototype #2 AFTER collecting pollen

Collect Data (CREATE! (refer to EiE Boston Engineering Kit data sheet)

Reflect

1. What worked well and why? _____

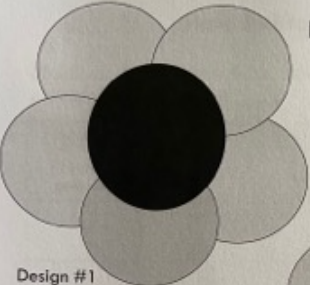
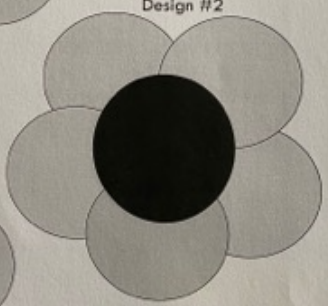
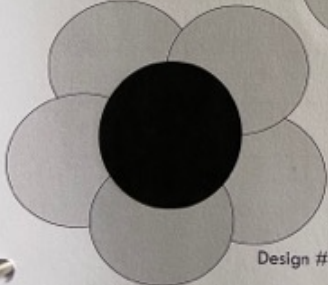

2. What part of the design do you need to improve upon and why? _____

COOPERATION: ☐ I worked well with my partner.
☐ I did not work well with a partner.

Name: _____

Date: _____

Data Collection: Prototype #2 (Boston Museum Data Sheet)

<p>Name: _____ Date: _____</p> <div style="text-align: right; border: 1px solid black; padding: 2px; width: 30px; float: right;">A B</div> <div style="clear: both;"></div> <p style="text-align: center;">Flowers for Testing Hand Pollinator Designs</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"><div style="text-align: center;"><p>Design #1</p></div><div style="text-align: center;"><p>Design #2</p></div></div> <div style="display: flex; justify-content: space-around; align-items: flex-start;"><div style="text-align: center;"><p>Design #3</p></div></div> <p><small>EE: Designing Hand Pollinators © Museum of Science, Boston Duplication Permitted</small> 4-13 <small>Lesson 4: Designing a Hand Pollinator</small></p>	<p>Name: _____ Date: _____</p> <div style="text-align: right; border: 1px solid black; padding: 2px; width: 30px; float: right;">A B</div> <div style="clear: both;"></div> <div style="display: flex; align-items: center;"><div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Design #</div><div>Designing a Hand Pollinator Engineering Design Process: Create!</div><div style="margin-left: 20px;"></div></div> <ol style="list-style-type: none">1. Did your hand pollinator pick up pollen? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">YesNo</div>2. How much pollen did it pick up? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">A lotA little bitNone</div>3. Did your hand pollinator drop off pollen? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">YesNo</div>4. How much pollen did it drop off? Circle one answer: <div style="display: flex; justify-content: space-around; width: 100%;">A lotA little bitNone</div>5. What parts of your hand pollinator worked well? How do you know? <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div><div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div><div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div>6. What parts of your hand pollinator did not work well? Why not? <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div><div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div><div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 5px;"></div> <p><small>EE: Designing Hand Pollinators © Museum of Science, Boston Duplication Permitted</small> 4-7 <small>Lesson 4: Designing a Hand Pollinator</small></p>
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Name: _____

Date: _____

Reflection

Pollinators			
	3	2	1
2.LS.2-Ecosystems	My model moved lots of pollen from one flower to another	My model moved some pollen from one flower to another	My model did not move pollen from one model to another
2.ETS.1- Engineering and design	I can ask questions, make observations and gather information about pollination	I can sometimes ask questions, make observations and gather information about pollination.	I can not ask questions, make observations and gather information about pollination.
2.ETS.2- Engineering and design	I can develop a simple sketch, drawing, or physical model of a pollinator.	I can sometimes develop a simple sketch, drawing, or physical model of a pollinator.	I can not develop a simple sketch, drawing, or physical model of a pollinator.
2.ETS.3- Engineering and design	I can analyze my pollinator's ability to collect pollen and explain what did and did not work well.	I can sometimes analyze my pollinator's ability to collect pollen and explain what did and did not work well.	I can not analyze my pollinator's ability to collect pollen and explain what did and did not work well.

Conclusion: What did you learn from this pollinator engineering design project?

Why is this learning important? _____

Name: _____

Date: _____

Engineering and Design Highlight

What did you enjoy during the pollinator engineer and design process?

Draw and color your enjoyable engineering and design highlights.
