

INTRODUCTION TO THE POLLINATOR HOTSPOT PROGRAM

Teacher:

Grade Level(s): K-6th

Time: 1 hour; options for continuous data collection

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Next Generation Science Standards:	<p>3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. 3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.</p> <p>4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p>
Enduring Understandings:	<p>LS3.B Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops. Similarities and differences in patterns can be used to sort and classify natural phenomena.</p>
Content Objective:	<p>Students will learn how to participate in the Arizona Sonora Desert Museum's (www.desertmuseum.org) <i>Pollinator Hotspot Program</i>. Students will identify barrel cactus, collect barrel cactus fruit, record specific properties of the plant, and enter information in an online database.</p>

Vocabulary	Materials
Barrel Cactus Seeds Spines Citizen Science	Data Sheets, Plastic Knives, Plates, Barrel Cactus Fruits, Scientific Journals, Meter Sticks Optional Materials: Computers or projector showing data-entry process, spray bottle, GPS units, sticky notes, gloves

Seasonality: Barrel cactus produce fruit in early July and October (Autumn); this presentation will work best in Autumn so that students can collect the fruit and the cactus information needed.				
Monsoon July-Sept.	Autumn Oct.-Nov.	Winter Dec.-Feb.	Spring Mar.-Apr.	Dry Summer May-June

Engage: Give each student or table group a handful of barrel cactus seeds. Allow students to explore the anatomy of the barrel cactus seeds. Ask students to look at color, structure, texture and other differences both within and between the seeds. Guiding Questions: What are these seeds? What is one unique thing you observed about these seeds?

Explore: Today, students will learn about a citizen science opportunity from the Arizona Sonora Desert Museum (ASDM). Guiding Question: What does it mean to be a citizen scientist? Think about each word separately and discuss with your neighbor. Citizen science is the collection and analysis of data relating

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to the natural world by members of the general public, typically as part of a collaborative project with professional scientists (Webster Dictionary). The citizen science project we will learn about today, called “Pollinator Hotspot” asks participants to:



1. Find a barrel cactus
2. Measure the plant (height)
3. Pick a fruit from the center of the fruit crown
4. Count the seeds in one barrel cactus fruit
5. Send ASDM the seed count, plant location, and the plant height.

Take students outside to explore any barrel cactus that might be located at the school. Ask students to use their body to explore the height of the barrel cactus (does it come up to your knee, your hip, your belly?) Explore the variety of fruits on the top of the cactus. Ask students to find examples of fruits that are ripe and unripe—what is the difference?

Explain: Guiding Questions: Think about the information that the “Pollinator Hotspot” program wants its citizen scientists to collect. Why might scientists feel this information is important to collect? Give students time to brainstorm ideas. Write ideas on the board.

Background information from the ASDM site: Human activities have changed the availability and distribution of many desert resources, including water. Ask students to discuss in their table groups different ways that this may be true. Guiding Question: How do native species such as pollinators respond to these human-induced changes (water, agriculture, buildings, and more)? Do you think there is a relationship between the number of seeds in a fruit and some other resource in that plant’s environment? More pollinators = more seeds! By counting seeds, we may be able to tell where there are more or fewer pollinators. Many of the pollinators in our Sonoran Desert are solitary (living alone; not in a hive or big group). This makes it difficult to count pollinators like carpenter bees. Fruits and seeds get produced with the help of insect pollination; by looking at fruit and seed production we may be able to also tell how many pollinators are nearby.

Elaborate: Let’s explore exactly how to collect our data! The following instructions are listed on the ASDM’s informational brochure.

How do I measure the plant? A yardstick works well. Try to measure from the base (where soil meets the plant) to the crown (the very top of the yellow fruits). Measure the plant’s total height, even if it means you have to hold the yardstick at a slant.

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How do I pick a fruit? Luckily, barrel cactus fruits don't have spines, but there are spines around them. Wait until the fruits are bright yellow, when they come off most easily. Try not to pick a fruit right at the center or edge of the crown—aim for in between to get an average size.

How do I count the seeds? The seeds are easiest to count when they are dry. Cut the fruit open and leave it somewhere to dry, like on a windowsill. Once it's dry, shake the seeds out into a bowl or cup. Count a small pile at a time so you can keep track.

Submitting your data: Data entry is easy! Find the datasheet at www.desertmuseum.org/hotspots. Type the location of the barrel cactus (either the GPS location or as much detail as you can), its approximate height, and the number of seeds. Finally, check the box for whether the plant is watered (if you don't know the answer).

Evaluate: Split the classroom into small teams and give them a data sheet. Each team should find one barrel cactus at the school (no duplicates) and go through each data collection step to submit information to the ASDM site. There can be a lot of seeds in one fruit; each team member may want to count a subset of seeds and add the total up with their teammates at the end. This data collection process can be repeated for as many fruiting seasons and cacti as available.

Students may use their new training and knowledge to find barrel cactus in their neighborhood and record this information. The more information from a diverse number of places, the better!

Short on time? Given time constraints, students can cut the fruit open over a plate using plastic knives and begin counting the seeds, *rather than* letting the fruits dry for 1 week. First, cut the top off of the fruit, then use the plastic knife to scrape the interior of the fruit and get all seeds out onto the plate. If your fruit and seeds prove to be sticky, use a spray bottle to slightly dampen the plate. Seeds will slide easily out of the fruit and along the plate, making it stress and sticky-free to use the knife to move and count the seeds.



Images: Kindergarten citizen scientists counting barrel cactus seeds. Photo credit: Michelle Coe.

