

Lesson 4

Sonoran Desert Insects


Teacher: Lauren Greene

Grade Level: 4th-6th

Lesson Length: 120 mins

This lesson has been adapted from: [Create an Insect: University of Nebraska](#) & [Insect Mouth Parts: Washington State University Extension](#)

AZ Science Standard:	<p>6.L2U1.13</p> <p>Develop and use models to demonstrate the interdependence of organisms and their environment including biotic and abiotic factors</p>
Learning Objective:	<ul style="list-style-type: none">• Students will be able to describe at least two similarities and two differences between the mouthparts of insects• Students will be able to identify at least two common characteristics of insects.

<p>Scientist of the Week:</p>	<ul style="list-style-type: none"> • Margaret James Strickland Collins (1922-1996)  <ul style="list-style-type: none"> • (on the left) • Entomologist (a person who studies insects) who specialized in the study of termites, and was also a civil rights advocate. Collins was nicknamed the "Termite Lady" because of her extensive research on termites • First black woman to obtain a PhD in entomology • Discovered a new species of termite (florida damp wood termite) • Studied resistance to drying in different termite species
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Vocabulary	Materials
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- - Exoskeleton
- Thorax
- Abdomen
- Antennas
- Wings

- [Powerpoint](#)
- Turkey baster (5)
- Plastic Tweezers (5)
- Smarties candies (a bag)
- Sponge piece (15, can be cut in half to get 30)
- Straw (class set)
- Baking soda (2 boxes)
- Party blowers (class set)
- 2 cups water
- Green food coloring
- Red food coloring
- Plastic wrap (roll)
- Rubber band (8)
- [Insect Trap Design Worksheet](#)
- [Bug Information Sheet](#)
- Tape
- Cotton Balls
- Yarn
- Paper Bags
- Paper Bowls

Guiding Questions

- What is the relationship between insects, plants, animals, and humans?
- What important ecosystem functions do insects perform in the Sonoran Desert?
- What is the impact of the worldwide decline of insects?

Engagement Activity(10 min):

- Ask students if they think that there are more insects or mammals on this planet.
- Allow students to share their thoughts as a class before presenting the following video
- [Why are there so many insects? - Murry Gans](#)(00:00-1:07)
- In the Sonoran Desert, insect population accounts for more species than all the other animal groups combined
 - Explain that there are many traits that make insects so abundant in their numbers such as their ability to breed, their small size (can escape easily from enemies), their endless food supply (tend to have diverse diets especially if scavengers) and more.
- Present the following video from (00:00-00:55)[Why insects are so crucial to life on Earth | BBC Ideas](#)
- Explain that different insects possess different qualities that allow them to have different "jobs" in the world. Some of these qualities include having different types of mouthparts, each specific for the type of work that they do in their own ecosystems. For example, some insects help with our decomposition processes while some help us with pest control etc.
- As a class, create a list on the board of the different functions of insects
 - ex: the video mentions that insects are food for other animals & they pollinate flowers & are essential to our food supply. Insects are also decomposers - they break things down - and they help make our soil healthy.
- Explain that today's activity is going to focus on one kind of physical adaptation which varies greatly among the different species of insects and allows them to exist in all parts of the ecosystem: insect mouth parts.

Exploratory Activity(40 min):

- Begin by asking students what physically makes an insect an insect:



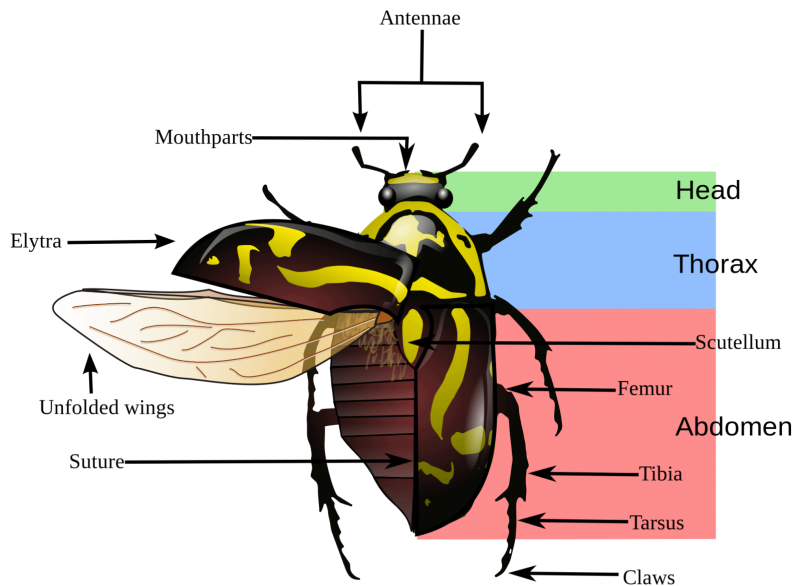
-Exoskeleton

-Six legs

-Wings (Not all but many)

-Three body parts: Head, Thorax, Abdomen

- Pass out the [insect anatomy worksheet](#)



- Present an insect model to students on the board and label it as they label their own worksheet
- Explain to students that with more than a million different types of insects on our planet, their diets vary greatly
- Allow students to brainstorm with their neighbors about what an insect might eat and encourage them to share with the class
- Ask students, "How do insects eat their food? Do you think all insects have the same type of mouths like you and I do?"
- Allow for students to share to the class their answers
- Explain that they will be taking a closer look at the different types of mouths insects have.
- In this activity, the students will be acting as field scientist, who are exploring the world of insects
- Hold up the items that represent different insect mouthparts

-Tweezers (Chewing Mouthparts) → Station 1

-Turkey baster (Sucking Mouthparts) → Station 2

-Party blower (Siphoning Mouthparts) → Station 3

-Sponge piece with straw inserted in middle (Sponging Mouthparts)→Station 4

- Ask students what they think each of the items has to do with an insect's mouth and prompt them to share their ideas with their neighbors
- Explain what students should do at each station by demonstrating at the front of the class before dividing students into four stations. Each station will have a focus on each mouthpart.
- When students are split up, hand out the [observation worksheet](#)
- Students will spend about 8 minutes at each station to:
 1. Follow the instructions for each station, which is also listed in the handout
 2. Record any observations they see doing each activity while answering the following questions:
 - a. **Data:** How did the (mouthpart) work?
 - b. **Hypothesis:** What type of food do you think insects with this type of mouthpart eat? Why?
 - c. **Inference:** How might this type of mouthpart help the insect in its environment? Think about how this adaptation helps the insect find or eat its food.
- **Station 1:** Students will use the tweezers to pick up Smarties candy from one bowl and bring it to another bowl.
- **Station 2:** Students will use clear plastic cups containing water colored with food coloring (one green for plant food and one red for blood) to show the different types of foods piercing insects eat. Before beginning, the teacher will place clear plastic wrap over each cup and secure them, with a rubber band. Then, with the tip of the turkey baster, one student will steady the cup while another student pierces the plastic wrap surface and sucks some of the liquid into the stem of the baster.
- **Station 3:** Students will simulate the coiled up proboscis using a party favor that unrolls when you blow in it. Students will show how a butterfly coils its mouthparts.
- **Station 4:** First have students attempt to pick up baking soda off of a plate with a dry sponge. Explain that to wet the food, flies spit fluid (vomiting) on their foods to moisten and soften them. The liquid dissolves some of the food, and flies can then sponge it up. Now students may wet their sponge and attempt to pick up some of the baking soda off of the plate.

Explain Activity(10 min):

- Once students have concluded their final station, ask students to find their seat and review each mouthpart with the class. Instead of lecturing, ask students to volunteer to read each station's description.
- Hand out images of each mouthpart for students to pass around the room.
- Explain the following as students look over at the diagrams for reference:
- **Station 1:** [Pass around a close up picture of a mandible mouth.] On an insect, the tweezer-like mouth parts are called mandibles. They can chew, cut, and tear. Insects with these mouthparts eat leaves, blades of grass, or large items that must be broken into smaller items. Examples of insects with these mouthparts are grasshoppers, ladybugs, caterpillars, beetles, etc. A plant damaged by an insect with chewing mouthparts usually looks as if someone took an insect-sized bite out of the edge of a leaf – like a bite from the side of a sandwich. They also use their mandibles to pick up smaller pieces and put them in their mouth.

- **Station 2:** [Pass around the enlarged photo of the Mosquito's mouth.] This mouthpart sucks up liquid! An insect with piercing/sucking mouthparts has a long, thin proboscis (an elongated sucking mouthpart that is typically tubular and flexible) that it inserts into a juicy leaf (or a juicy arm, in the case of the mosquito). It sucks up the nutritious plant sap from the leaf (or blood from an arm). Many plant pests have piercing/sucking mouthparts. Instead of holes along the edge of the leaf, like from the chewing insects, plants damaged by piercing/sucking insects have small spots or speckles across entire leaf surfaces. Other insects with these mouthparts include aphids, stink bugs etc.
- **Station 3:** [Pass around a close up image of a butterfly's mouthparts.] These items are similar to how a butterfly or moth's mouth works. Adult butterflies and moths have siphoning mouthparts that are a flexible tube that they slip into fluids, like nectar. These insects don't pierce their food. When they are not using their mouthpart, a butterfly or moth will coil up their mouthparts and tuck them away!
- **Station 4:** [Pass around a close up picture of a fly's mouth.] Flies are an example of an insect that has a sponging mouthpart. If you've ever watched a fly crawling on a surface, like your kitchen counter, you may have noticed that it continually presses its proboscis against the counter sponging up food. The end of the proboscis is blunt and rough, as opposed to the tubular-shaped proboscis of a mosquito or butterfly.

Extension Activity(40 min):

Activity adapted from ['Plant Heros'](#)

This activity will continue with the students acting as field scientists. In this part of the activity, they will be acting as scientists wishing to capture and study animals. They will be in groups of 3 and brainstorm a trap for bugs given certain materials that could work to capture it, then work together to create the trap.

- Tell students that they are still acting as scientists gathering information about bugs, and they will use this information to help them with this part of the activity
- Discuss the importance of bugs and their roles in the Sonoran Desert specifically. Also discuss the worldwide impact on the decline of bugs. Display the importance of bugs to help them understand why scientists(them right now) must study bugs and what these scientists do with the information they learn.
- Tell them that scientists only trap bugs when they have reason to, and always treat this process seriously
- Separate students into groups of 3-4 for this activity. Give each group a bug that they will be constructing a trap for, along with a sheet with simple data about the bug. Each group needs a trap design worksheet.
- Start with some opening questions to get students thinking about how their trap will look.
 - Pretend you are an insect, what would your day look like? What would you eat? Do you have any jobs you need to accomplish? Where might you live? Where and how do you travel? What food do you eat?
 - How can you use this information to create a more successful trap?
 - What are some natural bug traps that can possibly help you construct your own?

- Discuss how spiders and venus fly traps catch their prey
- Once they have some ideas in their head, instruct them to fill out the worksheet with their group where they think of what trap they want to make, and what materials they need
- Once groups are finishing up, bring the class together and have them share their ideas. Next, have them brainstorm on how they can construct the trap with materials given.
- Allow them to construct the trap that they had brainstormed with their teams, and share with the class if they wish
- Display a few bug traps that scientists use for various bugs, and ask them how these are similar and different to the ones they made.

Discussion :

- Ask the students about how the designing and building of their traps went. Ask what characteristics of the insects they used to make decisions about it. Ask what was challenging. How it was similar or different to commonly used traps. What other adaptations could be made

Evaluation Activity(10 min):

- Journal Reflection
- Ask “What is something that you learned today?” , “What was fun and challenging about the lesson?” , “Why is it important to learn about insects?”

Modified from the UA Community and School Garden’s Green Academy Lesson Plan Template