Lesson 3
Desert Adaptations

Teacher: Lauren
Grade Level: 4th-6th
Lesson Length: 120 minutes

This lesson has been adapted from: Bio/Diversity Project Lesson Title: Adaptations of Desert Animals and Desert Humans

AZ Science Standard:	6.L2U3.12 Engage in argument from evidence to support a claim about the factors that cause species to change and how humans can impact those factors 7.L1U1.10 Develop and use a model to explain how cells, tissues, and organ systems maintain life (animals). 8.L4U1.11 Develop and use a model to explain how natural selection may lead to increases and decreases of specific traits in populations over time
Learning Objective:	● Students will be able to identify the adaptations of animals that allow them to live in the Sonoran Desert environment. ● Students will be able to investigate the effects of heat and wind on evaporation. Students will learn about various adaptions animals have in the desert

Scientist of the Week: 	**Meagan Bethel** • Wildlife Specialist who manages camera data for wildlife programs • Teaches the public about wildlife and their identification through communications and graphic design • Interests lie with monitoring population changes using non-invasive techniques • Programs: Border Wildlife Study, Sky Island FotoFauna • Freelance artist specializes in plants and animals

Vocabulary	Materials
• Adaptation • Evaporation • Evapotranspiration • Natural Selection	• English Powerpoint • Spanish Powerpoint • Student Handout - Animal Adaptations to the Desert for each student (class set) - only the last page (page 3) • Buckets (Home Depot or Foldable) • 1 pack of paper towels • Access to water (sink, drinking fountain, etc.) • Stopwatches Beads and Gems Bowls Cups Straws, cardboard, plastic spoons, tweezers Lizard prints Colored pencils/ markers

Guiding Questions

- Why do animals need to adapt to the desert climate and conditions?
- What role does evolution play in adaptations?

Teacher Preparation:

- Bring buckets of water and paper towels outside. Find a spot where pavement is both in the sunshine and in shade.

Engagement Activity (15 min):

- Ask students the following questions by displaying it on the board. Prompt students to think about adaptations and what adaptations look like:
    - "List 3 activities that you do to keep cool when it's hot outside in Tucson."
    - Have students share with the class by raising their hands.
- Provide ways animals in the desert keep cool (burrowing, being active at night, microclimates, getting water from food) and examples of animals that have these adaptations.
- Tell students that they will be going outside to do a series of activities to demonstrate adaptations that desert animals have to help them live in the desert.
- Have students get into pairs, and each pair needs a worksheet and a stopwatch.
- Go over rules for being outside: listening carefully, following instructions, being mindful of the experiments and the results, etc.
- Lead the class outside for the Exploratory Activity

Exploratory Activity (25 min):

- Dip a paper towel in a bucket of water and wring the excess water into the bucket.
- Take the moistened paper towel and wipe it across the pavement that is in the sunshine. Watch the moisture begin to disappear.
- Ask the students, "What happened to the water?" (It evaporated into the air)
- Explain that here in the desert, it is hot and dry, and water evaporates into the air all the time.
- Ask the students, "What kinds of things does water evaporate from?" (clothes on a line, puddles, pavement, etc.) "Does water evaporate from plants and animals, too?" (yes)
- Ask, "Do you think it is hard for organisms to live in the desert where there is not much water and it evaporates easily?" "How do they survive?"(Prompt students to think about adaptations discussed in previous lectures)
- Discuss some adaptations we talked about before the activity and ask why these adaptations are so important for the survival of the animals.

- **ADAPTATION 1: RESTING IN SHADE OR IN A BURROW, ACTIVE AT NIGHT**
- Have one student in the pair dampen and ball up a paper towel and draw or write something simple on the part of the pavement in the sun
- Have the other student in the pair use the stopwatch to time how long it takes for the water to fully evaporate and add information to the worksheet
- Repeat this for the shady spot of the pavement
- Return to the classroom.

- Gather the students and create a simple chart on the board comparing drying times for initials in the sun versus the shade. Discuss any patterns or differences observed.

- Guide the students to calculate the average drying time for initials in the sun and the shade (you can do this as a class, summing up the times and dividing by the number of pairs).
- Ask, “What does this tell you about the sunny side?” (that water dries up more quickly in the sun)
- Ask, “If you were an animal living out in the desert, what might you do to keep cool and try not to lose much water?” (rest in the shade during the hottest times of day, come out when it is cooler)
- Explain that many desert animals are active either at night or in the cooler hours of the day. They pass the heat of the day resting in deep shade or down in burrows out of the sun. If needed, remind them of the animals we looked at before the activity

Explain Activity (15 min):

- Pass out Student Handout - Animal Adaptations to the Desert to each student.
- Point out that part of the picture represents daytime, the other part night.
- Ask the students to look at the picture and describe the adaptations they see that animals have to save water and keep cool. They should notice those already discussed – a fox in its den in the heat of the day, a javelina resting in the shade beneath a tree, a bird painting, a kangaroo rat active at night.
    - Have students circle these.
- Ask, “Can you see any other animal adaptations for life in the desert in this picture?”
    - The desert tortoise and jackrabbit are both resting in the shade. These animals have other desert adaptations as well. Desert tortoises store water in their bladders and can go a long time without drinking, but when it is hot they retreat to their burrows. Jackrabbits rest in the shade and use their big ears to cool down their blood. Their warm blood circulates into their ears and is cooled when exposed to the cooler air.
- Point out each animal in the picture, discussing their adaptations while taking student input.
    - Have the students circle them.
- Then ask, “Which animal does not seem adapted to the desert?” (The black bear.) “Why?” (It has thick hair and is out in the sunshine in the middle of the day.)
    - Have students put an X over the bear or make a note that the bear is better suited for the mountains.

Extension Activity (60 min):

- Introduce other adaptations of animals, specifically the size and shape of beaks of birds, and coloring of animals for camouflage into their environments.

Beak Adaptations Activity(25 min)

- Give examples of different types of Arizona birds, how their beaks differ, and which each beak is used for.
    - (Cactus Wren, Gila Woodpecker, Anna's Hummingbird, Great Horned Owl)
- Have students break into groups of 3-4 for activity

- Each group needs four types of “beaks” to test, and a bowl containing a mixture of beads and gems. Each student needs an individual cup to store their collected gems.
    - Beaks: tweezers, spoons, cardboard/paper pieces, straws(2, use like chopsticks)
- Tell students they will be picking up one gem at a time with only using their beaks(no hands allowed), and put them into their individual cup for two minutes until the timer runs out.
- Have students count how many gems they were able to collect, and take this information to make a simple chart on the board. This will be used later to see which beak seemed to have the most success.
- Keep track of individual students' gem counts to give the student with the highest amount candy when the whole activity is over.
- Have students mix any gems they collected back into the group's bowl, and rotate their beaks to the left.
- Continue this four times so each student has the opportunity to try each beak, and we can collect the most thorough data with more trials

  Discussion(5 min)
- Ask students about how they did in the activity. Ask them to look at the collected data to share what beak seemed to work the best and the worst. Connect it back to real life by asking how it shows the usefulness of different beaks for a specific environment. Ask “How do these adaptations help animals survive” and “Why is it important for animals to adapt to their environment”.
- Adaptations help animals to effectively find food suited for their environment

Camouflage Activity(25 mins)

- Give examples of animals in Arizona that have colorings that hide them in their environment.
    - Bobcat, Katydid, Desert Rattlesnake, Bark Scorpion, Great Earless Lizard
- Have lizard print outs for students to color and camouflage somewhere around the room.
- Give them 20 minutes to find somewhere they would like to put their lizard, and color it according to the background of the room.
- Allow them to cut after they have colored if they think it would be more beneficial.
- Once everyone is done, allow students to walk around the room and try to spot each others lizards

  Discussion(5 min)
- Ask students if they had any strategies about where they selected to put their lizard, and what patterns they used to color it. Ask if there were any parts of the activity that they found more challenging. Ask “How does camouflage help animals survive in the wild” and “What could happen if an animal was not well camouflaged to its environment.
- Camouflage helps both predators and prey blend in and survive. Predators are able to sneak up on their prey, and prey are able to easily hide from predators. If an animal was not colored properly for its environment, it would be easily spotted and either not be able to catch food, or caught.

Evaluation Activity (5 min):

- Ask reflection questions that could be discussed as a classroom. Ex: “What are ways that animals have adapted to help them survive that we looked at today” “What might happen if an animal is not adapted to live in the desert”, “Which activity was your favorite”
- Hand out journals, have students answer questions about lesson.
- “What is something you learned today”, “What was your favorite part of the lesson”, “What did you find challenging”