Field Trip in a Box

Desert Adaptations
Staff Trip in a Box
Desert Adaptations

National Park Service
Utah

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Contents

Introduction ............................. 5
Core Connections ...................... 5
Prep Activity ............................ 8
Teaching Station #1 ............... 9
Teaching Station #2 ............... 10
Teaching Station #3 ............... 12
Teaching Station #4 ............... 13
Assessment Activity ............ 14
References & Resources ....... 15
Introduction

THEME
High desert plants and animals are adapted to their environment in many different ways.

FOCUS
Desert plants, Birds, Deer and Mountain Lions

LOCATION SUGGESTIONS
• Windows Primitive Loop – behind North Window
• Balanced Rock Picnic Area
• Park Avenue - North side

LEARNING STATIONS

Optional Prep Activity (to be used if students are unfamiliar with desert ecosystems):

What’s My Adaptation? Take on the identity of a desert plant or animal

Field Trip Learning Stations
Each station is designed for up to 10 students and requires 1/2 hour and one instructor (for larger groups we recommend dividing your group and teaching stations simultaneously, then having students switch stations.)

1. Are Leaves Adapted? Observe leaves, and collect data in a scientific investigation to determine desert adaptations.

2. The Desert Ramble - Use plant keys to discover how traits are carried from parent to offspring.

3. Deer’s Ears - Pretend to be a mule deer, and use your keen sense of hearing to avoid your predators. Find out what adaptations your predators have for catching you as well.

4. Feathered Friends - Discover some adaptations unique to birds and go on walk searching for them.

Extension Back to School (assessment activity): Tell Me About It - Students work together to create brochures to educate others on the animals and plants found at Arches National Park.

Core Connections

This lesson has been designed specifically to connect with the Utah State Science Core Curriculum for 7th grade. However, the lesson also meets standards for 5th grade and high school biological science with some minor adjustments in teaching style and depth of content.

UTAH SCIENCE CORE CURRICULUM TOPIC – SEVENTH GRADE

Standard Four: Students will understand that offspring inherit traits that make them more or less suitable to survive in the environment.

Objective 1: Compare how sexual and asexual reproduction passes genetic information from parent to offspring.

Objective 2: Relate the adaptability of organisms in an environment to their inherited traits and structures.

Science language students should use: acquired trait, asexual reproduction, genetics, nucleus, organ, organism, osmosis, system, tissue, inherited trait, offspring, sexual reproduction, cytoplasm, diffusion, membrane, chloroplast, cell, cell wall

UTAH SCIENCE CORE CURRICULUM TOPIC – FIFTH GRADE

Standard Five: Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.

Objective One: Using supporting evidence, show that traits are transferred from a parent organism to its offspring.

Objective Two: Describe how some characteristics could give a species a survival advantage in a particular environment.

Science language students should use: inherited, environment, species, offspring, traits, variations, survival, instincts, population, specialized structure, organism, life cycle, parent organism, learned behavior
UTAH SCIENCE CORE CURRICULUM

TOPIC – SECONDARY BIOLOGY

Standard One: Students will understand that living organisms interact with one another and their environment.

Objective 1: Summarize how energy flows through an ecosystem.

Objective 3: Describe how interactions among organisms and their environment help shape ecosystems.

Science language students should use: predator-prey, symbiosis, competition, ecosystem, carbon cycle, nitrogen cycle, oxygen cycle, population, diversity, energy pyramid, consumers, producers, limiting factor, competition, decomposers, food chain, biotic, abiotic, community, variable, evidence, inference, quantitative, qualitative

Standard Five: Students will understand that biological diversity is a result of evolutionary processes.

Objective 1: Relate principles of evolution to biological diversity.

Objective 3: Classify organisms into a hierarchy of groups based on similarities that reflect their evolutionary relationships.

Science language students should use: evolution, fossil record, geologic record, molecular, homologous, vestigial structures, mutation, recombination, hierarchy, classification scheme, theory, natural selection, adaptation, evidence, inference, speciation, biodiversity, taxonomy, kingdom, virus, protist, fungi, plant, animal, dichotomy

Background

Desert plants are adapted to their arid environment in many different ways. Stomata are the openings in plant leaves through which water is transpired. Many desert plants have very small stomata and fewer stomata than those of other plants. The stomata of many cacti lie deep in the plants’ tissues. This adaptation helps cacti reduce water loss by keeping the hot, dry wind from blowing directly across the stomata.

The leaves and stems of many desert plants have a thick, waxy covering. This waxy substance does not cover the stomata, but it covers much of the leaves, keeping the plants cooler and reducing evaporative loss.

Small leaves on desert plants also help reduce moisture loss during transpiration. Small leaves mean less evaporative surface per leaf. In addition, a small leaf in the sun doesn’t reach as high a temperature as a large leaf in the sun.

Some plants, such as Mormon tea and cacti, carry out most or all of their photosynthesis in their green stems. (Cactus pads are stems, botanically speaking.) Some desert plants grow leaves during the rainy season and then shed them when it becomes dry again. These plants, including blackbrush, photosynthesize in their leaves during wet periods. When drought sets in and the plants lose their leaves, some of these plants can photosynthesize in their stems. Others cut down on water loss even further by temporarily shutting down photosynthesis.

Other desert adaptations shared by a number of plants include shallow, widespread roots to absorb a maximum of rainfall moisture and spines or hairs to shade plants and break up drying winds.

Other specific desert plant adaptations follow: (see included field guide for pictures)

Cacti - Cactus pads are modified stems with a waxy coating. Their root system is very shallow, drinking up ephemeral rainwater. Small rain roots can grow as soon as soil is moistened by rain. They later dry up. Prickly spines are modified leaves that can help shade the stem and break up the evaporative winds blowing across pad surfaces. Cacti utilize CAM photosynthesis, in which stomata open only at night when the plant is relatively cool, so less moisture is lost through transpiration. Gases, including carbon dioxide going in and oxygen going out, pass through the stomata as well. This gas exchange is part of the process of photosynthesis. But, photosynthesis also requires sunlight. The CAM process includes a way of chemically storing the carbon dioxide until the sun comes out, when it can be used to...
MORE INFORMATION

Station #1 Are leaves Adapted
Station #2 Desert Ramble
http://www.nps.gov/arch/naturescience/treesandshrubs.htm
http://www.nps.gov/arch/naturescience/wildflowers.htm
http://en.wikipedia.org/wiki/Pinyon_pine
http://en.wikipedia.org/wiki/Purshia
http://en.wikipedia.org/wiki/Gamble_oak
http://en.wikipedia.org/wiki/Blackbrush
http://en.wikipedia.org/wiki/Blackbrush
http://en.wikipedia.org/wiki/Mountain_mahogany
http://en.wikipedia.org/wiki/Mormon_tea

Station #3 Deer's Ears
http://en.wikipedia.org/wiki/Couger
http://en.wikipedia.org/wiki/Mule_deer
http://www.nps.gov/arch/naturescience/mammals.htm

Station #4 Feathered Friends
http://www.nps.gov/arch/naturescience/mammals.htm
http://www.allaboutbirds.org
http://en.wikipedia.org/wiki/Northern_flicker
http://en.wikipedia.org/wiki/Northern_Harrier
http://en.wikipedia.org/wiki/European_starling
http://en.wikipedia.org/wiki/Black_headed_grosbeak
http://en.wikipedia.org/wiki/Western_Meadowlark
http://en.wikipedia.org/wiki/American_Kestral
http://en.wikipedia.org/wiki/Yellow_Warbler

Desert Adaptations - These avoid drought and heat by surviving as long-lived seeds stored in the soil, sometimes for decades. The seeds have adaptations assuring that they germinate and grow during wet periods.

Evening Primrose - Thickened taproots store water and food.

Globemallow - These are covered with dense, star-shaped grayish hairs that reflect sunlight and break up the wind.

Juniper - Leaves are reduced to tiny, waxy scales that cover the twigs and small branches. Fruits are also covered with a waxy coating. Junipers have the ability to cut off water to a major branch during a drought, resulting in a dead branch but a live tree.

Sego Lily - It can lie dormant as a bulb during the driest years.

Paintbrushes - They are sometimes partial parasites. Their roots may tap into nearby plant roots, usually sagebrush or grasses, to suck food and moisture from their host.

Pineon Pines - They depend on enormous root systems. Pineon taproots stretch down 40 feet or more in deep soils; in shallow soils, lateral roots stretch outward the same distance.

Sagebrush - Hairy leaves insulate this plant against heat, cold, and dry winds. Retaining its leaves year-round allows the plant to produce food most of the year. Sagebrush has adaptations to cold winters: it can photosynthesize when temperatures are near freezing, and its leaves point in all directions, allowing them to catch sunlight from many different angles.

Some desert plants take advantage of the nights’ cooler temperatures to become “active.” Some evening-blooming plants in the desert include evening primrose, sacred datura, sand verbena and yucca. Cacti also take advantage of cooler nights.

Desert animals also take advantage of nighttime’s cool refuge. Without light for visual cues, desert animals rely on their other senses to help them navigate. Nectar-eating bats use echolocation to identify evening-blooming plants. Echolocation works similar to radar; the bat sends out a call, and then receives the waves that are reflected back. The reflection indicates the direction and distance of the reflecting object.

The yucca and the yucca moth have a fascinating nighttime association. After mating, the female moth gathers pollen from one yucca flower, packs it into a ball, and then flies into the night locating other yucca flowers primarily by “smelling” with her antenna. She visits several flowers, each time laying some eggs in the base of the pistil and packing some of the pollen from her pollen ball down the pistil for her young to feed on. Thus, she fertilizes the yucca flowers. Yucca flowers are only pollinated by yucca moths, and yucca moth young only feed on yucca pollen.

Mule deer have an array of adaptations that make them specifically suited to their environment. Their long necks and the location of their eyes on the sides of their heads allow them to see in every direction except directly behind them. The camouflage coloring of their coats is another defensive adaptation. Speed and agility are good examples of adaptive strategies as well; mule deer can move up to twenty feet in one bound. In addition, their large ears, which are roughly two-thirds the length of their head, allow for a keen sense of hearing. In comparison, a white-tailed deer’s ears are only one-half its head length. Hollow hair gives deer greater insulation from cold during winter months. Mule deer have behavioral adaptations, too. Because movement attracts prey, mule deer freeze if danger is nearby. If a predator is in pursuit, a mule deer’s zigzag bound increases its likelihood of escape.

In Utah, an average of 80 percent of a mountain lion’s diet consists of mule deer. The physical adaptations that make mountain lions successful predators include: powerful jaws that can crush a prey’s neck in one bite; sharp, pointed teeth; retractable claws for tearing meat; skin and fur between toe pads to muffle sound as they stalk, excellent day and night vision, and excellent depth perception so that they can attack with accuracy. Mountain lion behavioral adaptations include lying in wait and stalking, followed by bursts of speed for short chases.
Objectives
Students will be able to:

a. Describe or give an example of an adaptation.
b. Name two environmental characteristics to which an organism may adapt.

Materials
“Adapts” card, picture of plant with adaptations indicated. thirty pictures of plants or animals, each with adaptation descriptions on the back.

PROCEDURE

1) Show students the word “ADAPTS” and tell them it stands for “Animals Depend on their Activities and Parts to Survive.” Discuss that animal body parts and activities, or behaviors that help an animal succeed in a given environment, are called adaptations. Have students think of several examples of human activities and parts that help us survive. Next mention several animal activities and parts and discuss how each adaptation might help the animal to survive in its environment.

2) Explain that plant adaptations are physical ones (parts). Show the students a picture of a plant and discuss its physical adaptations (i.e. extra long roots to reach deep water, hairy, gray leaves to shade leaf surfaces and break up the wind in sunny, windy areas, and light, fluffy cottonwood seeds to disperse in the wind). Explain that plants have many physical adaptations, but they do not have behavioral adaptations (activities) like animals. Stress that humans or other animals can sometimes adapt behaviorally to new situations, but physical adaptations evolve slowly, over many generations. Discuss the conditions a plant or animal around Moab would have to adapt to, including lack of water, hot summertime temperatures, cold winter nights, and wind. (See background information in the folder for this information.) Use the plant and animal identification photographs as specific examples of how some plants and animals have adapted to their environments.

3) Have students close their eyes to begin the “What’s My Adaptation?” game (adapted from Cornell, 1979, 69). Hang a picture around each student’s neck, with the picture on his/her back. Instruct students to open their eyes, but not to look at their own tags. Show them a sample, and tell them that each picture is either a plant or an animal from our area. Instruct them to walk around the room and ask each other yes/no questions that will help them figure out what organism is on their back. A student may ask another student up to three questions before moving on to someone else. Review examples of good questions before the students get up from their seats.

4) As students figure out their creatures, they should sit down, turn their nametag over, and read the creature’s adaptations written on the back of the tag. When all students are seated, ask for volunteers to share their identities and read their adaptations.

5) Optional: Discuss the concept of adaptations in relation to genetic traits that are passed down from parent to offspring. Tell the students that occasionally an organism develops a different adaptation. If the adaptation helps the plant or animal, it is passed down to its offspring. If the adaptation does not help, the plant or animal will not survive to reproduce. Each of the plants or animals here in the desert, at one point or another, developed adaptations that made them more likely to survive than the organisms without these adaptations.
TEACHING STATION #1
The Desert Ramble

Objectives
Students will be able to:
a. Describe two environmental conditions of desert ecosystems.
b. Name one desert plant and describe one of its adaptations.
c. Understand that parent and offspring have similar characteristics.

Materials
Copies of Student key; copies of A Key to Common Desert Plants of Southeastern Utah.

PROCEDURE
1) Have students list what plants need to survive, and be sure that they include water, soil, and sunlight. Discuss characteristics of the desert that make it difficult for plants to grow. For example, it is dry, windy, hot in the summer, cold on winter nights, and there are animals that might eat the plants. Ask the students if a seed from a plant that usually lived near the river could grow in this environment. Have them discuss why or why not. Tell the students that occasionally a plant develops a different adaptation. If the adaptation helps the plant, it is passed down to its seedlings. If the adaptation does not help, the plant will not survive to reproduce. Each of the plants here in the desert, at one point or another, developed adaptations that made them more likely to survive than the plants without these adaptations.

2) Tell students we will be using what is called a plant key to identify some of the desert plants. In order to teach students how to use a plant key, tell them that they will be first using a student key. Show the students the “student key,” explain that the branches of the key represent physical traits of a student. Have one student leave the group. Then, pick one of the students who are left to be “it.” The entire group should study the traits of that person so that they will be able to answer questions. Have the first student return to the group and, using the student key, ask questions to determine which student is “it.” The first question is at the trunk of the key, “Is this person a male or female?” followed by questions about hair, eyes etc. The entire group should answer each question without looking at the “it” individual. If the questioner gets to the end of the key and still cannot determine which student is it, suggest another trait to ask about (tall vs. short; needs glasses or not, etc.). Play several times.

3) Ask the students to think about their parents. Do parents and children often look alike? Again, play the game. However, this time describe someone’s parent. While the player is gone, have one student describe the way his or her parent looks, so that the group may all answer. Have the player try to pick the student whose parent is being described. Play several times.

4) Pass out the copies of the Desert Plant Key, and briefly discuss their use. As a group, use the key to figure out the names of a variety of plants. Discuss each plant’s adaptations to living desert. See if students can find a seedling of each plant. If so, have the students compare the seedlings to the parent. For instance, discuss how a young juniper looks nothing like its stately parent, but its leaves are the same and it has similar adaptations.
Objectives
Students will be able to:
a. Find a desert plant and explain its leaf adaptation.
b. Describe the steps of the scientific process.

Materials
Hand lenses; small poster listing five adaptations; flower identification books; clipboards; pencils; copies of *Science Investigation Form: Are Leaves Adapted?*

PROCEDURE

1) Review and discuss the process of photosynthesis. All life comes from the sun’s energy, and this energy is gathered in leaves of plants and converted into usable plant energy. Remind students that the byproducts of this process include oxygen and water vapor. Loss of water is a concern for plants in the desert; therefore many plants have adaptations in their leaves to avoid losing large quantities of water (conservation). Some of those leaf adaptations are: (1) hairy or fuzzy leaves, (2) small leaves, (3) curled-up leaves, (4) wax-coated leaves, and (5) green stems but no leaves. Display small poster listing these five adaptations, and discuss them. Define small leaves as smaller than your thumb nail. Discuss the sixth adaptation of growing and reproducing fast before the hot season hits, then dying off. Discuss what might happen to a plant if they did not have these adaptations.

2) Tell students they are going to work in pairs and do a scientific investigation, using the scientific process. Pass out copies of the *Science Investigation Form: Are Leaves Adapted*, pencils, and clipboards. Go over the form, discussing the steps of the scientific process. Our question for the investigation will be, “If we observe six different plants, how many of them will have one of the leaf adaptations that we’ve listed for the desert environment?” Have them write their hypotheses.

3) Have students turn their papers over and draw a line in the center lengthwise and two lines perpendicular, creating six boxes. Explain that students will examine six different plants, and encourage them to use hand lenses. In each box students should draw one plant, describe which adaptations they see, if any, and name the plant, if they can, using the field guides provided. Descriptions may be brief. Define the study area, and send students out to collect data.

4) Gather students. Share some of their pictures and descriptions. Ask them how many of their six leaves had at least one of the adaptations on our list. Have them write this number down under results. Discuss why some of the leaves didn’t have the adaptations. (They may be annuals with seed adaptations rather than leaf adaptations, or they may have other types of adaptations.) Discuss, and have them write conclusions include which adaptations were the most prevalent in the area.
Are Leaves Adapted?

Scientist names:

Question:

Hypothesis (Prediction):

Procedure:
1. Observe a leaf
2. Draw the leaf
3. Record adaptations

Results (How many of the leaves that you observed had adaptations?):

Conclusions (Why do you think we found obtained these results?):
**Objectives**

Students will be able to:

a. State at least two physical and two behavioral adaptations of deer or their predators.

b. Relate the adaptations to function and/or survival.

**Materials**

Pictures of deer and mountain lions; replica skulls, fur samples and track casts; blindfolds.

**PROCEDURE**

1) Review the definition of **adaptation**. (Animals Depend on Activities and Parts to Survive.)

Show the students a picture of a mule deer and ask the students what parts it has that helps it to survive. Bring out the skull, fur and track cast as appropriate. When the deer’s large ears are mentioned, have the students place their hands in a cup shape behind their ears and listen to the sound of your voice. Discuss how having bigger ears helps focus sound and improves hearing. Ask the students what type of activities the mule deer does to help it survive. Discuss how a deer will stand still and listen, maybe just turning one ear to see if there is danger.

2) Review the definition of predator and prey. Tell the students that the next animal you will be discussing is one of the largest predators in the southwest and that 80% of their food is deer. See if the students can guess that you are talking about a mountain lion. Show them pictures of the mountain lion and have students discuss what parts it has that help it to survive. Bring out skull, fur and track as appropriate to the discussion. Finally, discuss activities that the mountain lion uses to help it to survive. Discuss how mountain lions will silently stalk a deer and then pouncing.

3) Introduce the game Deer vs. Mountain Lion (adapted from Henley, 1989, 158-159).

Designate one student as a deer, tell you are going to blindfold her, and put a cloth “tail” in her back pocket. Once she is in place she must stand like a grazing deer. She cannot move except to swivel in place. Tell the other students that they will pretend to be mountain lions, which are predators of deer. Tell the students that in real life mountain lions hunt alone, but for this game they all get to be lions. In this game their job is to try and catch the deer by pulling the tail out of her pocket. They must use all of the adaptations of a mountain lion to succeed. Tell the students that although the deer cannot move, she can protect herself. Instruct the deer to listen for the approaching predators and to point in the predator’s general direction (within reason) and shout “Starve!” if one is heard. If the deer is correct, that predator must quietly sit down and remain quiet until the round is over. (To make the event more realistic, limit the number of times the deer can say “Starve!” to the number of predators plus two.) The instructor should stand near the deer and clarify if the deer caught anyone with their “Starve!”

To begin the game, take the deer at least twenty feet away from the mountain lions and blindfold her. When she is ready, call out “All you hungry mountain lions, come get some supper!” at which point the stalking begins. When a mountain lion snatches the deer’s cloth tail, then the deer is dead.

As the game progresses, review deer and mountain lion adaptations that helped the students “survive.” Mention other adaptations that they might try. Discuss how the environment helped or hindered both animals and how animals use their environment to their advantage. For example a deer standing in a thicket of trees might be able to use the trees as camouflage. Discuss any sounds that may have tricked the players, such as an unrelated sound startling a deer away from a mountain lion or a mountain lion attacking as an unrelated sound distracts his prey. Let the predator who killed the deer be the next deer. Take him/her to a different area, and play again.
Objectives
Students will be able to:

a. Identify at least one bird sometimes seen at Arches.
b. Name two bird adaptations.

Materials
Migration Poster; map of Arches; bird information and photo cards; a few copies of Arches National Park bird checklists; anatomy of a bird poster; binoculars; bird field guide; bird song Identification with accompanying sound cards; a variety of bird calls.

PROCEDURE

1) Tell students that at this station you will be discussing the adaptations of birds. Ask them if they can think of any activities or parts that most birds share that might help them to survive. Parts may include feathers for flight or warmth, or hollow bones.

2) Introduce migration as an activity that helps birds survive. Ask students to name some reasons that birds migrate. Riparian areas are a resting area for migratory birds; using the International Migratory Bird Day poster as a prop, discuss the value of the Colorado River and its tributaries as a resting area on the Rocky Mountain Flyway. Show students the map of Arches National Park and ask them to point out the riparian areas in the park, but be sure to talk about the fact that birds are not just in the riparian areas; they can be found all over the park.

3) Ask students how birders might know a bird is near. Explain that sometimes a bird cannot be seen, but it can be heard. Ask students to name some reasons a bird might sing: call for a mate, alert others to danger, tell others the location of food, for pleasure, check in with the flock, etc.

4) Show students the Arches National Park bird checklist, and explain how to extract information from it. Hand out a bird card to each student, and have each find his or her bird on the Arches checklist. Give students a few minutes to read the card and prepare their presentations: each will read his or her bird’s name, show its picture, tell how abundant it is in each season, and read an adaptation or interesting fact about the bird from the bird card. After each presentation, play the bird’s call on the Identification, and discuss if students have heard that call before. Some of these birds might travel to students’ home areas.

5) Tell students that one mistake people new to bird watching often make is taking a quick glance at a bird and immediately start looking through a book trying to find out what type of bird it is. The bird often flies away before while they are looking at the book. A better strategy is to carefully examine the bird the entire time the bird is visible, making mental notes of certain features that will help them identify the bird later. Show students the anatomy of a bird poster and discuss the parts of the bird they should examine if they see a bird they want to identify. Discuss how adaptations to these parts can help you discover what type of bird it is; for example the shape of the beak can tell us what the bird eats.

6) Pass out binoculars, and show students how to use them. Preface the bird walk with the need for no talking and quiet walking. Remind students that they are much more likely to hear birds than see them. Tell the students they are to keep track of how many different bird calls they hear. Have students share their discoveries by pointing to birds, frogs, nests, or other things that they hear or see. Hike as far away from your original spot as time and safety allow, leaving a few minutes to stand still at the far point for students to watch and listen. Return to the spot where you started the station, and collect binoculars.

7) Ask students how many different calls they heard. Ask students why they were more likely to hear birds this time of day than they were to see them. Review the adaptations that birds have for survival.
ASSESSMENT ACTIVITY

Tell Me About It

PROCEDURE

Divide students into groups. Tell each group that their assignment will be to create an 8½ x 11 brochure about plant and animal adaptations at Arches. Each brochure should include:

- An explanation of characteristics of the desert ecosystem that would make life difficult for plants or animals.
- Four pictures of desert plants labeled with their names and physical adaptations.
- Four pictures of desert animals labeled with their names and several adaptations for survival in the desert.

Students can gather more information for their brochures on the internet or from brochures available at the Arches Visitor Center.

Arches would like to have quality examples of student work. Please send copies to:

Canyon Country Outdoor Education
Arches National Park
P.O. Box 907
Moab, Utah 84532

GRADING RUBRIC

Plant and Animal Adaptations Brochure

<table>
<thead>
<tr>
<th>4 Points</th>
<th>3 Points</th>
<th>2 Points</th>
<th>1 Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brochure correctly describes 4 characteristics of the desert ecosystem that would make life difficult for plants or animals.</td>
<td>Brochure correctly describes 3 characteristics of the desert ecosystem that would make life difficult for plants or animals.</td>
<td>Brochure correctly describes 2 characteristics of the desert ecosystem that would make life difficult for plants or animals.</td>
<td>Brochure does not correctly describe characteristics of the desert ecosystem.</td>
</tr>
<tr>
<td>Brochure contains 4 pictures of desert plants correctly labeled with their names and physical adaptations.</td>
<td>Brochure contains 3 or 4 pictures of desert plants correctly labeled with either their names or physical adaptations.</td>
<td>Brochure contains 2-4 pictures of desert plants.</td>
<td>Brochure contains does not contain pictures of desert plants.</td>
</tr>
<tr>
<td>Brochure contains 4 pictures of desert animals correctly labeled with their names and several adaptations for survival in the desert.</td>
<td>Brochure contains 3-4 pictures of desert animals correctly labeled with their names or several adaptations to survival in the desert.</td>
<td>Brochure contains 2-4 pictures of desert animals.</td>
<td>Brochure contains does not contain information about desert animals.</td>
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References and Resources


