Activity Overview

In preparation for their visit to the Desert Botanical Garden, students first review the definition of adaptation and discuss some examples of plant and animal adaptations to the environments in which they live. Students then describe the specific environmental conditions of a desert and consider ways that the roots, stems, and leaves of desert plants are adapted to life in the desert environment. Students then read the provided *Mesquite or Saguaro? Adaptation Cards* and decide whether the adaptation described is that of a mesquite or a saguaro. Based on this initial inquiry of desert plants, students develop a list of questions to ask their guides and observations to make during their field trip.

To support the Inquiry in the Garden lesson plans, you may also use the tutorials and Virtual Habitat in DBG’s Digital Desert. These interactive activities will prepare students for their investigations by teaching them about the characteristics of deserts and the Sonoran Desert habitat.

Materials

(Note: All of the following materials are provided as downloadable graphics.)

- Pictures of the following plants:
  - Mesquite tree
  - Saguaro

- Mesquite or Saguaro Adaptation Cards (5 cards in all)

continued…
Learning Objectives

Upon completion of this activity, students will be able to…

- define adaptation and give examples of plant and animal adaptations to their environment.
- describe the environmental conditions of at least two different environments.
- explain the difference between physical and behavioral adaptations and provide examples of each.
- list and describe at least three environmental conditions of a desert environment.
- list and describe the functions of plant roots, stems, and leaves.
- describe at least three adaptations of desert plants.

Background Knowledge

These are concepts the educator should understand and can be found in the glossary.

Behavioral adaptation

Environment

Environmental conditions

Investigate

Physical adaptation
**Activity Procedures**

1. **Introduction.**

   Explain to students that they will be visiting the Desert Botanical Garden where they will be discovering some fun and amazing “secrets” about desert plants. The secrets have to do with how some plants adapt to the desert environment. The following activity will help the class prepare for the field trip.

2. **Review adaptations.**

   Since the focus of the field trip is plant adaptations, begin this activity by discussing the definition of **adaptation** and reviewing examples of adaptations to different **environments**. Some questions to help guide your discussion could include:

   - *What is an adaptation?*

     *Can anyone give an example of an animal’s adaptation to its environment?*

     *Can anyone give an example of a plant’s adaptation to its environment?*

   As students respond to the questions, be sure the following points are covered as part of the discussion:

   1. **An adaptation is a physical or behavioral characteristic of a plant or animal that help it survive in its environment.**

   2. **There are many examples of animals adapting to their environment including a duck’s webbed feet to help it swim, a hummingbird’s long bill to help it reach nectar, or a jackrabbit’s long ears to help it keep cool in the hot desert.**

   3. **There are many examples of plants adapting to their environment including a cactus’s spines for protection or trees losing their leaves during the freezing winter.**

   4. **Every environment presents specific challenges for the plants and animals that live there.**

   *continued…*
Activity Procedures

3. As a class, complete the environmental conditions and adaptations table.

Make a table on the board using the example below as your guide. Include the headings and listings of ocean, Arctic, and rainforest. Leave the rest of the cells blank to start. Reiterate that different environments present different survival challenges for plants and animals depending on the environmental conditions. Ask students the following questions:

What are “environmental conditions?”

What are the specific environmental conditions of an ocean environment?

<table>
<thead>
<tr>
<th>Environment</th>
<th>Environmental Conditions / Survival Challenges</th>
<th>Adaptations for survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean</td>
<td>wet, watery environment, no free oxygen, wave action, salty, water pressure, limited visibility</td>
<td>fins for swimming, gills for breathing, some sea plants and animals attach to ocean floor, ability to extract or otherwise deal with salt, swim bladders in fish, use of sonar to detect prey</td>
</tr>
<tr>
<td>Arctic</td>
<td>extreme cold, snow, ice, no sun in winter</td>
<td>thick, warm fur, fat storage, white fur, migrate during extreme cold</td>
</tr>
<tr>
<td>Rain Forest</td>
<td>wet, warm, shady (under the canopy), wet and dry seasons, shallow soil</td>
<td>large leaves for gathering sunlight, timed blossoming (with the seasons), aerial roots, plants grow on plants (epiphytes), leaves that channel water</td>
</tr>
</tbody>
</table>

Refer to the table above to help guide student’s responses. Write their answers in the correct cell of the table on the board. After students have described the ocean environment, ask them to brainstorm ways that plants and animals adapt to living in the ocean environment. Write their responses in the table on the board, again using the table as a guide. Complete the rest of the table in the same manner, first considering the environmental conditions and then the adaptations for survival in that environment. (Note that the answers may be brief, with just a few adaptations for each environment to serve as examples.) Discuss environmental conditions and adaptations using the table as a guide.

continued…
**Activity Procedures**

4. **Behavioral and physical adaptations.**

Refer to the completed table and ask students to consider which of the listed adaptations are physical and which are behavioral. Explain that a **physical adaptation** is a specific structural feature of a plant or animal’s body (such as webbed feet). A **behavioral adaptation** is an action or behavior (such as migration) that helps an animal survive. Discuss student responses.

5. **The desert environment.**

Ask students if they can remember the name of the botanical garden the class will be visiting. *The Desert Botanical Garden!* So what kind of environment should be expected there? **A desert environment!** Ask students to think of the **environmental conditions** associated with a desert and list those on the board. Students should at least come up with the following:

- **hot**
- **dry**
- **sunny**

Lead a discussion on the desert environment. If students live in the desert, ask them to explain ways that they deal with living in the desert. **What do students do to stay cool in the summer? Do they drink more in the summer? Why?** Explain that many of the things people do to stay cool and hydrated in the desert are behavioral adaptations. During the field trip, the class will be investigating how plants adapt to our hot, dry, sunny desert environment. Do students think that these adaptations will be **behavioral** or **physical**?

Explain that the plant adaptations you will be investigating will be primarily physical, that is, they will be specific structural characteristics of the plants that help them survive and even thrive in the desert. Unlike humans, who can move into the shade, turn on an air conditioner, or pour a glass of water, plants are rooted in one place and must rely on their physical attributes to survive. Fortunately for desert plants, they have developed some amazing adaptations to deal with desert conditions!

*continued…*
Activity Procedures

6. Plant parts.

Ask students:

What are the main structures (or parts) of plants?

Students should come up with roots, stems, leaves, and flowers. Point out that the investigations will mainly focus on the structural adaptations of plant roots, stems, and leaves. Conduct a class discussion on the purposes of each of these plant parts. To begin the discussion, ask the students, “What is the purpose of plant roots?” Repeat this question for each plant part and discuss student responses. Help students come up with the following:

- Roots provide support for plants (help them to stay up).
- Roots collect (or drink) water for plants.
- Stems provide structure and support for plants (hold plants up and give them their shape).
- Leaves make food for plants.
- Flowers produce seeds for plant reproduction.

continued...
7. **Mesquite or Saguaro? Adaptation Cards.**

Point out that the class will be focusing mainly on two desert plant species and their roots, stems, and/or leaves. These desert plants have developed some very interesting adaptations for living in the desert which the class will investigate during their field trip. Display the picture of the saguaro cactus. Ask students if anyone knows the name of this plant. Have the entire class say, “saguaro cactus.” Display the picture of the mesquite tree. Ask students if anyone knows the name of this plant. Have the entire class say, “mesquite tree.”

Ask students to study the two pictures and specifically consider the roots, stems, and leaves of each of the plants. Ask students to also consider the environment (desert) that these plants live in and the conditions they must deal with.

Call on five students and as they come up, hand each student one of the Mesquite or Saguaro? Adaptation Cards. Explain that one at a time, they should read their card to the class. Allow all five students to read their cards (without comments from the class) before beginning a class discussion on the mesquite and saguaro adaptations. The Adaptation Cards read as follows:

*Mesquite or Saguaro? I have very deep roots that seek out water deep in the ground.*

*Mesquite or Saguaro? I have long, shallow roots that can quickly drink up water after a rainstorm.*

*Mesquite or Saguaro? I have special stems that can expand to store water.*

*Mesquite or Saguaro? I have tiny leaves that help conserve water.*

*Mesquite or Saguaro? I have no leaves but have many spines which provide protection and shade.*

After all the students have read their cards, conduct a discussion by first reviewing each card and discussing the possibilities of it being an adaptation of the mesquite or saguaro. Some of the adaptations are more obvious than others. However, to find out the answers for certain, the class will be conducting an investigation at the Desert Botanical Garden. At the Garden, students will get to see desert plants up close and personal and discover their adaptations, specifically, the adaptations just discussed for saguaro and mesquite.
Activity Procedures

8. Prepare for your field trip investigation.

Remind students that during the field trip, they will be investigating the saguaro, mesquite and other desert plants to discover their secrets to adapting in the desert environment. Ask students the following:

*What does it mean to investigate and how could we investigate plant adaptations at the Desert Botanical Garden?*

Discuss student responses and help student to come up with the following:

*To investigate means to find the answer to a question through a system of inquiry or research.*

*We can investigate by asking the guide good questions.*

*We can read information in a book, online, or on signs at the Garden.*

*We can investigate by observing the plant in question.*

*We can investigate by setting up an experiment to help us answer our questions.*

Ask students what kinds of investigation might be most practical during their field trip – especially considering the adaptations of mesquite and saguaro just discussed. Help students understand that observing the specific plants will be one of the best ways to discover their adaptations. Also, simply asking their guide good questions is encouraged. Students should however, be sure to be prepared with good, clear questions to ask.

To help the class prepare for their field trip, have students come up with a list of at least five questions to ask their guide and at least five specific things they will look for (or observations they will make) that suggest a plant’s adaptation to life in the desert environment. They should think of the *Mesquite or Saguaro?* activity as they make their lists. Write their responses on the board and consider having students copy the list or designating several students to be “keepers of the questions and observations.” Be sure the class brings their lists of questions and observations on their field trip!
Inquiry in the Garden
Secrets of Desert Plants
Mesquite or Saguaro?

I have very deep roots that seek out water deep in the ground.
Mesquite or Saguaro?

I have long, shallow roots that can quickly drink up water after a rainstorm.
Mesquite or Saguaro?

I have special stems that can expand to store water.
Mesquite or Saguaro?

I have tiny leaves that help conserve water.
Mesquite or Saguaro?

I have no leaves but have many spines which provide protection and shade.
## TEACHER’S GUIDE FOR THIRD GRADE-
### INQUIRY IN THE GARDEN – STAGE 1

### Secrets of Desert Plants

**Related ADE Standards:**

### Reading Strand 1: Reading Process

<table>
<thead>
<tr>
<th>Concept 3: Phonics</th>
<th>Performance Objective</th>
</tr>
</thead>
</table>
| Decode words, using knowledge of phonics, syllabication, and word parts. | PO 1. Read multi-syllabic words fluently, using letter-sound knowledge.  
PO 2. Apply knowledge of basic syllabication rules when decoding four- or five-syllable written words. |

### Reading Strand 3: Comprehending Informational Text

<table>
<thead>
<tr>
<th>Concept 1: Expository Text</th>
<th>Performance Objective</th>
</tr>
</thead>
</table>
| Identify, analyze, and apply knowledge of the purpose, structures, and elements of expository text. | PO 1. Identify the main idea and supporting details in expository text.  
PO 5. Interpret information from graphic features (e.g., charts, maps, diagrams, illustrations, tables, timelines) of expository text. |

### Writing Strand 1: Writing Process

<table>
<thead>
<tr>
<th>Concept 1: Prewriting</th>
<th>Performance Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prewriting includes using strategies to generate, plan, and organize ideas for specific purposes.</td>
<td>PO 1. Generate ideas through a variety of activities (e.g., brainstorming, graphic organizers, drawing, writer’s notebook, group discussion, printed material).</td>
</tr>
</tbody>
</table>

### Language Arts Strand 3: Listening and Speaking

<table>
<thead>
<tr>
<th>Standard 3: Listening and Speaking</th>
<th>Performance Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students effectively listen and speak in situations that serve different purposes and involve a variety of audiences.</td>
<td>LS-F1. Use effective vocabulary and logical organization to relate or summarize ideas, events and other information.</td>
</tr>
</tbody>
</table>
**Related ADE Standards:**

### Science Strand 1: Inquiry Process

**Concept 1: Observations, Questions, and Hypotheses**

<table>
<thead>
<tr>
<th>Performance Objective</th>
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</thead>
<tbody>
<tr>
<td>PO 1. Formulate relevant questions about the properties of objects, organisms, and events of the environment using observations and prior knowledge.</td>
</tr>
<tr>
<td>PO 2. Predict the results of an investigation based on observed patterns, not random guessing.</td>
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</tbody>
</table>

### Science Strand 4: Life Science

**Concept 1: Characteristics of Organisms**

<table>
<thead>
<tr>
<th>Performance Objective</th>
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<tbody>
<tr>
<td>PO 1. Describe the function of the following plant structures:</td>
</tr>
<tr>
<td>- roots – absorb nutrients</td>
</tr>
<tr>
<td>- stems – provide support</td>
</tr>
<tr>
<td>- leaves – synthesize food</td>
</tr>
<tr>
<td>- flowers – attract pollinators and produce seeds for reproduction</td>
</tr>
</tbody>
</table>

**Concept 4: Diversity, Adaptation, and Behavior**

<table>
<thead>
<tr>
<th>Performance Objective</th>
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<tbody>
<tr>
<td>PO 1. Identify adaptations of plants and animals that allow them to live.</td>
</tr>
</tbody>
</table>

### Workplace Skills Strand 1

**Standard 1:** Students use principles of effective oral, written and listening communication skills to make decisions and solve workplace problems.

<table>
<thead>
<tr>
<th>Performance Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO 1. Listen effectively</td>
</tr>
<tr>
<td>PO 2. Analyze/evaluate orally received information</td>
</tr>
<tr>
<td>PO 3. Respond appropriately</td>
</tr>
</tbody>
</table>