Activity Overview

In this activity, students prepare for their visit to the Desert Botanical Garden by applying the scientific method to investigate desert plant adaptations. Students first review the specific steps of the scientific method with an understanding that they will be following those steps in their upcoming investigations. Students are next divided into four teams to study either desert leaf size, seed dispersal, water storage in desert plants, or how leaf color affects plant temperature. Each team studies photographs, makes observations, asks questions, formulates a hypothesis, and makes predictions about their assigned plant adaptations. Students also suggest ways that their predictions might be tested. A Student Study Guide is provided to help them in the process. Each team then shares their pictures and reviews their responses with the rest of the class. A final class review and discussion further prepares students for their trip as they consider ways they might test their predictions during their field investigations at the Desert Botanical Garden.

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.)

Student Study Guide – Investigating Desert Plant Adaptations

Desert Plants Adaptations – One set of pictures for each study team:

Leaf Size Team Pictures:
- Sonoran Desert habitat scene
- Various desert plants with small leaves
- Rainforest habitat scene
- Various rainforest plants with large leaves

continued…
Materials

Seed Dispersal Team Pictures:
• Parent plants and offspring in the Sonoran Desert
• Seed dispersal
• Pictures of different seeds:
  – Mesquite pods
  – Ironwood seeds
  – Jojoba seeds
  – Clematis seeds
  – Bursage seeds
  – Anasazi seeds

Water Storage Team Pictures:
• Pictures of saguaro cactus:
  – Saguaro cactus in desert scene
  – Full saguaro ribs
  – Thirsty saguaro ribs

Leaf Color Team Pictures:
• Desert scene depicting plants with light colored leaves
• Close-ups of different desert plants with light colored leaves
• Forest scene depicting a variety of plants with dark colored leaves
• Close-ups of forest plants with dark leaves

continued…
**Learning Objectives**

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

- List and describe the steps in the scientific process.
- Use the scientific method to conduct a simple investigation.
- Articulate questions about desert plants by making careful observations.
- State a hypothesis about the small size of desert plants’ leaves.
- State a hypothesis about different ways desert plants disperse their seeds.
- State a hypothesis about the shape and size of saguaro stems.
- State a hypothesis about why many desert leaves are light in color.
- Suggest ways that different predictions may be tested.

**Background Knowledge**

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

- Adaptation
- Hypothesis
- Inquiry Process
- Observation
- Prediction
Activity Procedures

1. Introduction.

Explain to students that they will be visiting the Desert Botanical Garden where they will be studying desert plants and their special adaptations to desert living. Through an inquiry discussion, review with students the name of our desert (the Sonoran Desert) and the characteristics of deserts in general (hot, dry, high evaporation, low rainfall, and extreme temperature fluctuations).

2. Review and discuss adaptations.

Have students consider the characteristics of a desert and think about how plants survive in such conditions. Ask them to share their thoughts on how desert plants survive. Steer responses to a discussion on adaptation and make the following key points:

Adaptations are physical or behavioral characteristics that help a plant or animal survive in its environment.

Desert plants have developed a variety of special adaptations to help them survive in desert conditions.

continued…
**Activity Procedures**

3. **Review the scientific method.**

   Explain that in this activity they will be working in teams to investigate different desert plant adaptations. Teams will use the scientific method in their investigations. If necessary, review the scientific method with students and reinforce the steps used in the scientific method. You may use the following as a guide in your discussion:

   The scientific method follows a series of logical steps to help explain the world around us. The steps are:

   - **Make observations** – The first step in the process is to observe the world around us and to take note of the natural phenomena that occur.
   - **Ask questions** – When something is observed, it usually provokes a question. Asking questions gets our attention and guides our focus.
   - **Form a hypothesis** – A hypothesis is a possible explanation that answers the question provoked by the observations.
   - **Make a prediction** – A prediction is made to test the hypothesis. A prediction states what will happen when the hypothesis is tested through some kind of experiment or investigation. A prediction is an “if” “then” statement: “If (the hypothesis) is true, then (the prediction) should happen.”
   - **Conduct an investigation** – The next step in the process is to perform an experiment to test the prediction.
   - **Record results** – The data gathered during an experiment or investigation are the results.
   - **State conclusions** – A conclusion states whether or not the hypothesis is true based on the results of the experiment.
   - **Share your knowledge** – Allow others to gain from your findings by sharing your knowledge.

If possible, use an example to guide the discussion. Some example questions to generate observations and questions to get the discussion started could include:

- What happens when an object held above the ground is dropped? What do you observe?
- What happens when you don’t water a potted plant? What do you observe?
- What do you notice when a piece of bread sits at room temperature for a long time?

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5. **Continued…**
Activity Procedures

4. Create student teams and hand out materials.

Divide the class into four teams. Assign each team a topic for investigation: leaf size; seed dispersal; water storage; or leaf color and hand each team the photographs associated with their investigation. Give each student a copy of the Student Study Guide – Investigating Desert Plant Adaptations and review the Study Guide questions with the class, answering any questions students may have.

5. Give students time to complete their Study Guides.

Allow time for students to review and discuss their Desert Plants Adaptations pictures with their team. Although working in teams and sharing the pictures, each student should complete their own Study Guide.

6. Team presentations.

Have each team share their pictures, observations, questions, hypotheses, and predictions with the rest of the class. Before they suggest ways they might test their predictions, have the rest of the class contribute ideas how they think the predictions could be tested. Discuss each team’s and the class’s predictions.

7. Review in preparation for field trip.

Review each adaptation, associated hypothesis stated by the investigating team, and possible tests. Remind students that they will be investigating all these plant adaptations during their visit to the Desert Botanical Garden.

Lesson Modification: Instead of working in teams, go through each set of Desert Plant Adaptations pictures and complete the Student Study Guide as a class. To do this, make a copy of the Student Study Guide for use on an overhead projector or smart board, or copy the five steps on a white board. Then complete the Student Study Guide on the board discussing each step as a class. Refer to the Desert Plant Adaptation pictures as needed. Repeat the process for each of the four Desert Plant Adaptations.
Sonoran Desert Habitat
Leaf Size – Desert Plants
Rainforest Habitat
Leaf Size – Rainforest Plants
Parent plants and offspring in Sonoran Desert
Seed Dispersal
Mesquite Pods
Ironwood Seed
Jojoba Seed
Clematis Seed
Bursage Seed
Anasazi Seed
Saguaro Cactus
Inquiry in the Garden

Science of Survival

Full Saguaro Ribs
Thirsty Saguaro Ribs
Leaf Colors in a Sonoran Desert Scene
Leaf Color – Desert Plants
Leaf Color – Forest Plants
Instructions: Each team has a set of pictures that provides clues to specific adaptations of desert plants. Whether you are studying leaf size, water storage, seed dispersal, or leaf color all the information you need to begin your investigation is in your pictures. Study your team’s Desert Plant Adaptation pictures carefully. In the spaces provided below, write down your observations, come up with a question about your observations, and develop a hypothesis that might be an answer to your question. Finally make a prediction about your adaptation and describe a way to test your prediction.

1. Make Observations. Describe your pictures. What specific details about desert plants do you observe in the pictures? In some cases, you may have pictures of plants from other habitats for comparison. What do you notice about the desert plants in comparison to other plants?

2. Ask questions. Write down one question about your observations. Consider a question that begins with “why” or “how” as this kind of question can help you form your hypothesis.

3. Develop your hypothesis. Your hypothesis is a statement describing one possible reason for your observations. It answers your “how” or “why” question.

4. Make a prediction. If your hypothesis is true, what would you expect to happen if you tested it?

5. Suggest ways to test your prediction. You will be investigating this adaptation during your trip to the Desert Botanical Garden. What are some things you could do to test your prediction during your field trip?
**Related ADE Standards:**

### 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>
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</tbody>
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### Writing Strand 3: Writing Applications

<table>
<thead>
<tr>
<th>Concept 2: Expository</th>
<th>Performance Objective</th>
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<tbody>
<tr>
<td>Expository writing includes nonfiction writing that describes, explains, informs, or summarizes ideas and content. The writing supports a thesis based on research, observation, and/or experience.</td>
<td>PO 1. Record information (e.g., observations, notes, lists, charts, map labels and legends) related to the topic.</td>
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</table>

### Language Arts Strand 3: Listening and Speaking

<table>
<thead>
<tr>
<th>Standard 3: Listening and Speaking</th>
<th>Performance Objective</th>
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</thead>
<tbody>
<tr>
<td>Students effectively listen and speak in situations that serve different purposes and involve a variety of audiences.</td>
<td>LS–E2. Prepare and deliver an oral report in a content area and effectively convey the information through verbal and nonverbal communications with a specific audience.</td>
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## RELATED ADE STANDARDS:

### SCIENCE STRAND 1: INQUIRY PROCESS

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

**Performance Objective**

PO 1. Formulate a relevant question through observations that can be tested by an investigation.

PO 2. Formulate predictions in the realm of science based on observed cause and effect relationships.

#### Concept 2: Scientific Testing (Investigating and Modeling)

**Performance Objective**

PO 2. Plan a simple investigation that identifies the variables to be controlled.

### WORKPLACE SKILLS

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

**Performance Objective**

PO 1. Deliver a factual presentation using appropriate terminology.

PO 2. Use a variety of formats such as data, graphs and technical manuals to support a presentation.