

TEACHER'S GUIDE FOR THIRD GRADE- INQUIRY IN THE GARDEN - STAGE 2

Alternate Field Investigation



Saguaro Cactus

ACTIVITY OVERVIEW

In this investigation, students venture outside for a teacher-led, plant adaptations discovery walk in their own schoolyard. This activity is offered as an alternative field investigation for classes unable to visit the Desert Botanical Garden. The purpose of this activity is to get students outside and involved in real, hands-on field investigations about plants. It is suggested that classes first conduct the Secrets of Desert Plants, Inquiry Stage 1- Introductory Activity in preparation for this investigation. Although that introductory activity is primarily for classes visiting the Desert Botanical Garden, it provides foundational concepts which are further explored in this investigation.

TEACHER PREPARATION

The purpose of the plant adaptations discovery walk is for students to see plants in nature that exhibit a variety of root, stem, and leaf adaptations. It is suggested that teachers first scout the school grounds before taking the students outside. Decide on a route which would be good for a plant adaptations discovery walk. The route should include a variety of plants including trees, shrubs, and cacti (if possible). It is recommended that at least three specific places or “stops” be identified along the route that would serve as focal points to discover the “secrets” of plants: special adaptations of plant roots, stems, or leaves. The teaching stops should include a focal plant or plants that allow for the conveyance of the *Teaching Points* presented for each of the plant parts. Teachers should feel free to use more than one stop for each plant part if they are unable to find examples for all the teaching points at one stop.

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Agave

GENERAL PROCEDURES

Guide students on an outdoor walk following your pre-planned route. At each stop, conduct an inquiry to convey the *Teaching Points* presented for that stop. Students should use their *Student Investigation Journals* to record observations and evidence during the discovery walk. Following each discussion, conduct one or more of the suggested activities. Wrap up your walk by discussing students' discoveries and reviewing the *General Teaching Points*. When the class is back inside, review the entire investigation by walking students through the *Concluding Activity*.

Plant Adaptations Discovery Walk

General Teaching Points

- The three main parts of plants are the roots, stems, and leaves.
- Roots, stems, and leaves differ in form but provide the same basic functions for plants.
- Plant roots, stems, and leaves have adaptations to help them survive.
- Plants respond to environmental factors.

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Roots: Saguaro Cactus

GENERAL PROCEDURES

Roots Stop

Description

The roots stop is best located near a large tree. It would be ideal (though not necessary) if there were some large tree roots exposed above ground. It is also preferable for there to be other types of plants (such as smaller trees, shrubs, cacti and/or grasses) nearby for comparison.

Teaching Points

- Roots differ in form but provide the same basic function for plants.
- Roots provide support for plants (help them stay up).
- Roots collect (or drink) water for plants.
- In many plants, the roots are at least as deep and wide as the part of the plant above ground.
- Some tree roots, like mesquite and cottonwood, grow very, very deep into the ground.
- Some roots have special adaptations for survival.

Discussion and Activity Suggestions

At the roots stop, conduct an inquiry using the teaching points as your guide. Questions to help students arrive at the key points for this stop could include the following:

Where are the roots located on this tree?

Can you see any of the roots?

What is the function of a root system?

What do you think the shape and size of a root system looks like for this tree?

What water source(s) do you think this tree will use?

Are this tree's roots adapted to this environment? How?

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Roots: Agave

GENERAL PROCEDURES

After students have had a chance to discuss roots, choose and conduct one or more of the following suggested activities. Students should record in their *Investigation Journals*.

Have students...

- Stand up with feet together and arms spread wide. Tell them to keep their feet together but move their upper bodies as if they were trees swaying in the wind. Then have students spread their feet apart about shoulder width and “sway” around some more. Ask students which feels more stable, feet apart or together? How might a tree’s roots be underground to give it more stability, apart or together?
- Divide into small groups. Tell students that in many plants the roots are at least as deep and wide as the part of the plant above ground. Have one person in each group stand up to represent a tree. Have the other students in the group use a piece of string to measure how tall the “student tree” is and determine how far out its roots could spread. Students should also visualize how deep that piece of string would go into the ground. Have students consider how the placement of roots is an adaptation for collecting water. Estimate approximately how many inches/centimeters or feet/meters their length of string measures. Use rulers when back in the classroom to compare the accuracy of the estimations.
- Look at other plants nearby. Draw pictures of several plants, based on what they observe above ground and what they predict the roots look like underground.

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Stems: Saguaro Cactus

GENERAL PROCEDURES

Stems Stop

Description

The stems stop should offer a variety of plants with different kinds of stems. Including a cactus in the stem stop would be useful. (If there are no cacti in your schoolyard, consider using a small potted cactus.) A tree at or near this stop offers the opportunity to point out its trunk and branches.

Teaching Points

- Plant stems differ in form but provide the same basic function for plants.
- Plant stems provide support and structure for plants.
- Plant stems help support leaves, flowers and fruit.
- Plant stems provide the “highway” in which food and water travel throughout the plant.
- Some stems have special adaptations for survival.

Discussion and Activity Suggestions.

At the stems stop, conduct an inquiry using the teaching points as your guide. Questions to help students arrive at the key points for this stop, could include the following:

Are all these stems alike?

How are this plant's stems similar/different to that plant's stems?

What do these stems do for this plant?

Are this plant's stems adapted to this environment? How?

What is different about this cactus's stems?

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Stems: Agave

GENERAL PROCEDURES

After students have had a chance to discuss stems, choose and conduct one or more of the following suggested activities. Students should be recording in their *Investigation Journals* during this exploration.

Have students...

- Find, describe, and draw stems with different textures. Ask students to consider how the texture of a stem could be an adaptation to the environment.
- Find and draw two different colors of stems. Ask students to consider how the color of a stem could be an adaptation to the environment.
- Pour water on a dry sponge and observe what happens. (This works best with a very thin, tightly pressed sponge.) Explain that some cacti expand like a sponge when they soak up water from their roots into their stems. This is an adaptation for living in a desert. Ask students if they see any plants around them with similar adaptations.
- Fold a strip of paper into an accordion with half-inch pleats. (In advance, prepare one-inch wide strips of paper that are 11 inches long.) Place the two ends of the strip together to create an accordion circle. Have students play with their accordions by shrinking and expanding the size of the circle. Explain to the students that the pleats represent the ribs in a saguaro cactus. When the pleats are close together, they represent a thirsty saguaro. When the pleats are stretched out, they represent a saguaro whose ribs have expanded after a big rainfall.
- Use a piece of string to measure the circumference of a saguaro cactus (if one is available) during a dry season and again during a rainy season. Make predictions in advance about how the measurements will compare. Be sure to record the data in a safe place because many months might pass between the two measurements. (Remind students to be careful of cactus spines!)

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Leaves: Saguaro Cactus

GENERAL PROCEDURES

Leaves Stop

Description

Locate an area near which are a variety of plants with different types of leaves. Students will venture from this stop to discover the variety of leaves nearby. Look for plants that have leaves that are small, large, round, pointed, very tiny, different colored, odd shaped, etc. Include cactus in this stop if possible. (If there are no cacti in your schoolyard, consider using a small potted cactus). If there are any agave in your schoolyard, discuss the point that agave have fiber in their leaves. The fibers provide structure for the agave.

Teaching Points

- Plant leaves differ in form but provide the same basic function for plants.
- Leaves make food for plants.
- Leaves allow water to evaporate from the plant.
- Some leaves have special adaptations for survival.

Discussion and Activity Suggestions

At the leaves stop, conduct an inquiry using the teaching points as your guide. Questions to help students arrive at the key points for this stop, could include the following:

From where we are, how many different kinds of leaves do you see?

Can you name some ways that leaves are different/similar?

Do any of the leaves we see have special characteristics?

What do leaves do for a plant?

Are this plant's leaves adapted to this environment? How?

Are there any plants with no leaves at all? Why?

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Leaves: Agave

GENERAL PROCEDURES

After students have had a chance to discuss leaves, choose and conduct one or more of the following suggested activities. Students should record in their *Investigation Journals*.

Have students...

- Sit quietly for 2 minutes and see how many different types of leaves they can find.
- Find and draw at least three different types of leaves.
- Find, draw and color at least two different colors of leaves.
- Find, feel and describe at least two different leaf textures.
- Find and describe a leaf adaptation for cooling the leaf surface.
- Find and describe a leaf adaptation for reducing the rate of water evaporation from the plant.

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CREATE A PICTURE WITH WORDS

Remain at the leaves stop (or choose a fourth location with a variety of vegetation and space for the students to sit). Ask students to sit quietly for a few minutes and observe their surroundings. Ask them to use their senses to see, hear, and smell the environment around them without any discussion. They should also recall the sense of touch from the leaves activity. Suggest using one sense at a time to really focus their observations. Then students can use their *Investigation Journals* to write a poem based on their reflections.

Tell them they are each going to write a poem based on their sensory experiences during this outing. What did they experience with their senses? What stands out in their memory? For each sense (touch, sight, sound, smell), students should write a descriptive line. The last line should be a description of how the experience makes the student feel emotionally. Follow the example below to guide students in the development of their sensory poems.

Example:

I *feel* the rough bark of the tree.

I *see* the leaves blowing in the wind.

I *hear* birds singing.

I *smell* spring flowers.

I *feel* happy.

When the students have completed their poems, ask for volunteers to read their poems out loud to the class. Ask students the following questions:

Did you make similar observations?

Did writing and listening to poems help you to see new or unexpected secrets about the environment?

Classroom “Poet-Tree” follow-up: In advance, post a paper tree trunk with branches on a classroom bulletin board or wall. During class, have each student draw and cut out one of the leaf shapes they observed on the discovery walk, and copy their poem onto it. Have students post their leaves on the branches to create a “Poet-Tree”.

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CONCLUDING ACTIVITY

Procedures

1. Back in the classroom review and discuss the students' experiences during their Classroom Investigation.
2. Review main concepts and terms and how they applied to the Plant Adaptations Discovery Walk (the investigation).
3. Go over the data collected from the students' journals and have students analyze or interpret their data.
4. Explain that students will now continue to follow the scientific method and make conclusions about that investigation.
5. They should then consider their results and articulate their conclusions. Each student should come up with a new question they would like to investigate based on their Discovery Walk today.
6. Explain to students that an important part of the scientific process is sharing your findings with others. Discuss the value of sharing scientific information (so that others may learn from the work and to expand everyone's understanding of the subject). Scientists typically publish their work in scientific journals. Students will prepare a final presentation of their investigation to share with others, both in class and by posting online on the *DBG Journal of Student Findings*.
7. Give students time to prepare a final presentation display of their investigation. Using the information from their Investigative Journals, they may choose to create a poster, create graphs or tables for their data, draw pictures, and/or include photographs taken during their Discovery Walk or acquired from the internet. Encourage student creativity in the display of their work. (*Note: For more ideas on art projects that tie into Garden themes, go to the Additional Resources section of the Digital Learning website.*)
8. Have students share their displays and compare their investigations with the rest of the class.

POST YOUR FINDINGS ON THE INTERNET!

As part of the Inquiry Process students may share their work with others by visiting the *DBG Journal of Student Findings* at <http://www.dbg.org/index.php/digital/students/journal>. Here, students can submit investigation findings, poems, or original art inspired by their *Inquiry in the Garden*. For more ideas on art projects that tie into Garden themes, go to the *Additional Resources* section of the *Digital Learning* website.



ALTERNATE FIELD INVESTIGATION PLANT ADAPTION DISCOVERY WALK STUDENT INVESTIGATION JOURNAL

Name _____

1. Roots

Use string to **estimate** how tall the Student Tree is and how wide the Student Tree's roots are.

_____ meters tall _____ meters wide

Actual length of string (back in class, using a ruler) _____ meters

Predict what roots of real plants would look like underground.
Draw the plant, then draw its underground roots.

2. Stems

Draw the texture of different stems around you.

Record the colors of stems around you.

Distance around a saguaro stem:

Dry Season	Rainy Season
_____ centimeters	_____ centimeters



ALTERNATE FIELD INVESTIGATION PLANT ADAPTION DISCOVERY WALK STUDENT INVESTIGATION JOURNAL

Name _____

3. Leaves

How many different types of leaves can you find? _____

Draw at least 3 different types of leaves.

How many different colors of leaves can you find? _____

How many different textures of leaves can you find? _____

Describe 2 different textures of leaves.

4. Create a Picture with Words

I feel _____

I see _____

I hear _____

I smell _____

I feel _____

5. New Question

Back in class come up with a new question that you would like to know the answer to.

I wonder.....

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RELATED ADE STANDARDS:

WRITING STRAND 1: WRITING PROCESS

CONCEPT	PERFORMANCE OBJECTIVE
C5: Publishing	PO 1: Prepare writing in a format (e.g., oral presentation, manuscript, multimedia) appropriate to audience and purpose. PO 2: Share the writing with the intended audience.

WRITING STRAND 3: WRITING APPLICATIONS

CONCEPT	PERFORMANCE OBJECTIVE
C1: Expressive	PO 2: Write in a variety of expressive forms (e.g., poetry, skit) that may employ: a. figurative language f. appropriate format

LANGUAGE ARTS STRAND 3: LISTENING AND SPEAKING

STANDARD	PERFORMANCE OBJECTIVE
S3: Listening and Speaking	LS-F1: Use effective vocabulary and logical organization to relate or summarize ideas, events and other information. LS-F2: Give and follow multiple-step directions.

MATH STRAND 1: NUMBER SENSE AND OPERATION

CONCEPT	PERFORMANCE OBJECTIVE
C3: Estimation	PO2: Estimate length and weight using U.S. customary units. PO3: Record estimated and actual linear measurements for real-life objects (e.g., length of fingernail; height of desk). PO4: Compare estimations of appropriate measures to the actual measures.

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RELATED ADE STANDARDS:

MATH STRAND 4: GEOMETRY AND MEASUREMENT

CONCEPT	PERFORMANCE OBJECTIVE
C4: Measurement - Units of Measure -Geometric Objects	PO1: Select the appropriate measure of accuracy: <ul style="list-style-type: none"> length – centimeters, meters, kilometers, PO4: Measure a given object using the appropriate unit of measure: <ul style="list-style-type: none"> length – centimeters, millimeters, meters, kilometers, PO8: Compare the length of two objects using U.S. customary or metric units.

SCIENCE STRAND 1: INQUIRY PROCESS

CONCEPT	PERFORMANCE OBJECTIVE
C1: Observations, Questions, and Hypotheses	PO1: Formulate relevant questions about the properties of objects, organisms, and events of the environment using observations and prior knowledge. PO2: Predict the results of an investigation based on observed patterns, not random guessing.
C2: Scientific Testing (Investigating and Modeling)	PO4: Use metric and U.S. customary units to measure objects. PO5: Record data in an organized and appropriate format.
C3: Analysis and Conclusions	PO2: Construct reasonable interpretations of the collected data based on formulated questions. PO5: Record questions for further inquiry based on the conclusions of the investigation.
C4: Communication	PO3: Communicate with other groups to describe the results of an investigation.

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RELATED ADE STANDARDS:

SCIENCE STRAND 4: LIFE SCIENCE

CONCEPT	PERFORMANCE OBJECTIVE
C1: Characteristics of Organisms	PO 1: Describe the function of the following plant structures: <ul style="list-style-type: none"> • roots – absorb nutrients • stems – provide support • leaves – synthesize food
C3: Organisms and Environments	PO 5: Describe how environmental factors (e.g., soil composition, range of temperature, quantity and quality of light or water) in the ecosystem may affect a member organism's ability to grow, reproduce, and thrive.
C4: Diversity, Adaptation, and Behavior	PO 1: Identify adaptations of plants and animals that allow them to live in specific environments.

EDUCATIONAL TECHNOLOGY STRAND 2: COMMUNICATION AND COLLABORATION

CONCEPT	PERFORMANCE OBJECTIVE
C1: Effective Communications and Digital Interactions	PO 1: Communicate digitally with others by selecting and using a variety of appropriate communication tools.
C2: Digital Solutions	PO1: Contribute to a cooperative learning project and demonstrate effective group behaviors while using digital collaborative resources.

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RELATED ADE STANDARDS:

WORKPLACE SKILLS STANDARD 1: STUDENTS USE PRINCIPLES OF EFFECTIVE ORAL, WRITTEN AND LISTENING COMMUNICATION SKILLS TO MAKE DECISIONS AND SOLVE WORKPLACE PROBLEMS.

STANDARD	PERFORMANCE OBJECTIVE
IWP-F1. Describe how the five senses are used in communications.	PO 1: Identify the five senses. PO 2: Provide examples of each sense in action.
IWP-F3. Apply critical listening skills (e.g., listening for content, long-term contexts, emotional meaning, following directions).	PO 1: Listen effectively. PO 2: Analyze/evaluate orally received information. PO 3: Respond appropriately.
IWP-F5. Share ideas, opinions and information with a group, choosing vocabulary that communicates messages clearly, precisely and effectively.	PO 1: Participate in groups. PO 2: Speak to a group. PO 3: Share writing with a group.