

Plant Survival and Adaptation

Lesson Sequence and Description

The pre-post visit activities (*Experimenting with Plant Growing Conditions*) will provide students the opportunity to observe how plants respond to different growing conditions—ones that are optimal and ones that are not. The inherited characteristics of a plant determine the optimal growing conditions or range of conditions a plant can tolerate. However, changes in environmental conditions can render a plant unhealthy or dead. By providing children the opportunity to observe what happens to the same species of plant, they can use their observations to construct an argument about why the plants they observed did not do so well in various conditions—such as lacking particular adaptations that are necessary for survival in the new environmental conditions.

During the Garden visit students will explore how plants adapt to various habitats in the Garden. They will learn about how plants have adapted to the non-living and other living aspects of their habitats. The visit to the different habitats and growing conditions in the Garden may encourage students to adjust their hypotheses about what will happen to the plants in the classroom experiment.

Plant Survival and Adaptation

Pre-Post Visit Activity

Activity: Experimenting with Plant Growing Conditions

Materials Needed

Four “Plant Observation Sheets page 1 and page 2” for each student (one for each plant ID).

Four house plants of the same species, size and appearance.

Container large enough to hold one of plants and water enough to keep the soil saturated.

Overview

This series of lessons will provide students the opportunity to observe how plants respond to different growing conditions—ones that are optimal and ones that are not. The inherited characteristics of a plant determine the optimal growing conditions or range of conditions a plant can tolerate. However, changes in environmental conditions can render a plant unhealthy or dead. By providing children the opportunity to observe what happens to the same species of plant, they can use their observations to construct an argument about why the plants they observed did not do so well in various conditions—such as lacking particular adaptations that are necessary for survival in the new environmental conditions.

Set-up Procedure—Prior to your visit to the Garden

1. Purchase four house plants that are of the same species, size and appearance (flowers or not). Determine the optimal growing conditions for the plant you chose—for example, most house plants do not do well in full sun or a lot of water. Label each plant with an ID letter: A, B, C or D.
 - a. Cheaper option: get some dried beans from the supermarket, soak about 10 overnight and then plant these in four separate containers. In about a week and a half you should have 4 plants that you can bring into the classroom for this lesson.

Grade: 3

Guiding Question

How do plants respond to different growing conditions?

Timing

20 minutes to set-up; and 2 weeks to observe; 20 minutes to conclude

MA STE Standards addressed in lesson

3-LS3-2: Distinguish between inherited characteristics and those characteristics that result from a direct interaction with the environment. Give examples of characteristics of living organisms that are influenced by both inheritance and the environment.

3-LS4-3: Construct an argument with evidence that in a particular environment some organisms can survive well, some survive less well, and some cannot survive.

3-LS4-4: Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.

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Pre-Post Visit Activity

2. Find a container large enough to hold one of plants and water enough to keep the soil saturated. Make a place to keep one of the plants in a very low light condition—a cabinet or closet.
3. Introduce the experiment to students: *We are going to investigate how plants respond to different growing conditions. Changes in a natural habitat can have a big effect on the plants that live there when the change happens, and the kinds of plants that may be able to live there in the future. Over a long period of time, plants can evolve different tools to help them cope with the new habitat conditions. When we visit the Garden in the Woods, we are going to see many examples of the different ways plants have to survive in very different habitat conditions (very wet, very dry, hot, cold, etc.). Observing how changing some of the habitat / growing conditions of a common houseplant may help you think about plant adaptations.*
4. Pass out the Plant Condition Data Sheet to all the students. Introduce the growing conditions that you are going to investigate: A. optimal (average soil moisture and some light), B. excess water (as a model for sea level rise or flooding related to climate change), C. no water (as a model for drought), and D. low light (as a model for shade as a result of new buildings).
5. Have the students write down what they think might happen to the plants in each of these conditions and how long it might take before they see any differences. Review the other data that they will record on the data sheet and have them make their first observations of each plant.
6. Once students fill up “Page 1” of the observation sheet, they can continue adding as many “Page 2” sheets as they need for the experiment.

Observation Procedure—Overlap with visit to Garden

7. Have students take 5 minutes daily to record observations for two weeks or until obvious changes to the plants occur in each of the three “stress” conditions. Optimally, the visit to the Garden would occur during this observation period.

Conclusion Procedure—After your visit to the Garden

8. Have children review all of their observation sheets, and their hypotheses about how each growing condition would affect the plant.
9. Have children answer the guiding questions (either individually in writing first, or directly in a discussion):
 - a. How do plants respond to different growing conditions? Why?
 - b. What adaptations do you think this plant would need to survive in each of these growing conditions?

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Pre-Post Visit Activity

10. You will want to reinforce some of the adaptations that were discussed during the visit for each condition.
 - a. Living in water—need special types of roots to prevent drowning; need to be able to repel water from the leaves for photosynthesis to occur; need special air-filled stems to float
 - b. Living in dry habitats—shallow roots to quickly absorb water, or really deep roots to tap into underground sources; leaf coverings such as hairs to prevent dehydration; thin leaves that orient upwards so that the high noon sun is not hitting all of the leaf surface and causing dehydration.
 - c. Living in low light habitats—large leaves to capture the little sun that makes it to the plant; parasitize other plants instead of photosynthesizing yourself; or grow quickly before larger plants shade you out for the season.

Name: _____ Date Experiment Started: _____ Plant ID _____

Growing Conditions _____

How do you think this plant will respond to its growing conditions?

Observation Date	How tall is the plant?	What color are the leaves?	What do the leaves look like? Wilted, dry,....	What does the stem look like??	Any other observations?

Name: _____ Observation Sheet Number: _____ Plant ID _____

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