EXPLORATION 2 **HANDS-ON ACTIVITY**

# Needs for Growth

**Activity Guide, pages 88–89**

**TIME ESTIMATE**

45 min

**INVESTIGATIVE PHENOMENON**

Plants gain weight and grow when able to make food.

**POSSIBLE MATERIALS**

- ☐ one-week-old seedling in pot
- ☐ six-week-old plant in pot
- ☐ pan balance or scale

**PREPARATION**

For each group, the seedling and the mature plant should be the same type of plant.

In order for students to rule out soil as the source of the adult plant's weight gain, minimize any difference in soil weight between seedling and adult plant. You may wish to grow the plants, using identical pots and equal weights of soil. If you start with grown plants, make sure that both pots have the same weight of soil. As an alternative to small groups, use a single class setup.

**Phenomenon Explained** Students explore the **investigative phenomenon** that plants need the right conditions to live and grow by collecting and analyzing data to demonstrate that plants gain weight as they grow.

**Form a question** After observing the photograph, students should form a question about how the weight of a plant changes over time. If students struggle to form a question, ask them to consider what plants need to live and grow. **Sample answer:** How much of a plant's added weight comes from soil?

**Analyze your data** Students should use the data table provided to record their weight measurements. They will need to carefully separate the parts of each plant system (plant, soil, pot).

Alternatively, you may supply weight measurements for the pots and soil, so that students need only to measure the plants' weights. Confirm that students' recorded data are reasonable.

- **Make a Claim** Students' claims should indicate that the increased weight of the plant must be from air, water, or a combination of both.
- **Evidence** Students should cite as evidence the data from the activity that show that the weight of the plant increases as it grows, but the weight of the soil shows no/little change.
- **Reasoning** Students should explain their reasoning that access to soil must not be necessary for the plant to grow and increase in weight.

**FORMATIVE ASSESSMENT**

## MAKING SENSE OF PHENOMENA

Students gain understanding that, as they grow, plants gain weight as they explore the **investigative phenomenon.** They should connect this to the **anchoring phenomenon** that plants absorb water from the soil, which allows them to make food and is one reason for their increase in matter (weight). Students should understand that the soil is not the source of the plant's weight gain.

**REMEDIATION** If students struggle to connect the **investigative phenomenon** back to the **anchoring phenomenon,** review and discuss their data, which indicate that plants do not get food from soil. If they did, the weight of the soil in the pot with the six-week-old plant would be considerably less than the weight of the soil in the seedling's pot. In future Explorations, students will learn that plants make their own food. This process also produces materials that plants need to build new tissue (matter). This helps explain why plants gain weight and grow when they are able to make food.

### MAKING SENSE OF PHENOMENA IDEA ORGANIZER

After completing Exploration 2, students can fill in the **Idea Organizer** to summarize the connection between plants gaining weight as they grow and the anchoring phenomenon that potted plants absorb water from the soil, which is at least partially responsible for the increase in matter (weight) as they grow.

# Activity Outcome

Students should understand that as plants grow they gain weight, but soil is not the source.

| Performance Indicators | |
|---|---|
| | record observations about the plants' growth patterns and physical appearance |
| | make a claim that access to soil is not necessary for plant growth |
| | support a claim with evidence that the plant is growing and gaining weight without soil losing weight |

EXPLORATION 3

# Plant Needs

**Activity Guide, pages 90–91**

**TIME ESTIMATE**

15 min

**Materials Alert** For this exploration, have a hand lens available so that students can look at the illustrations on their Interactive Worktext pages.

You may want to have a variety of leaves and a microscope available for students to support their discovery and to teach the content of the Exploration as a Hands-On Activity.

**INVESTIGATIVE PHENOMENON**
Plants need water, nutrients, and air to grow.

**Phenomenon Explained** Students explore the **investigative phenomenon** by gathering evidence that supports the claim that plants need water, nutrients, and air to stay healthy and grow.

## Drink It In

Before students read the text on the page, have them examine the two pictures of the plant. In pairs, have students discuss their ideas about why the plant on the left is wilted and what it would need to be healthy again. Encourage students to reflect on the Hands-On Activities and any everyday experiences to inform their conversation. After they read the text, have students identify information in the text that supports their initial ideas or helps them revise their ideas.

## Nutrients

Students may use a model to illustrate how plants take in nutrients through their roots. Models should include how the dissolved nutrients move from the roots into the stem and then to the rest of the plant.

**Sample answer:** water, air, and nutrients. Students might also say sunlight. However, they should recognize that soil is not needed for growth.

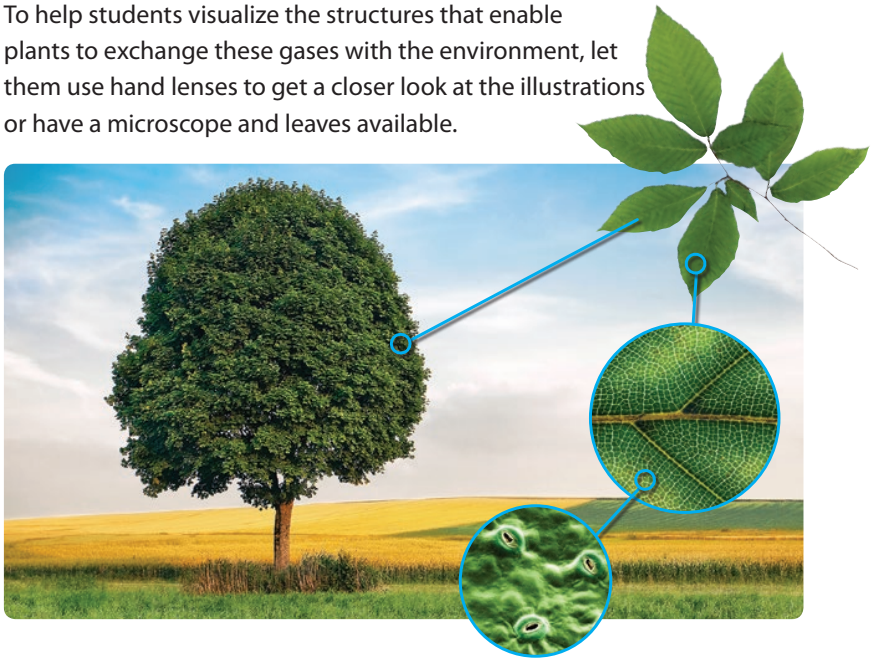


HMH

# In and Out

**Everyday Phenomenon** **The air we breathe out is different from the air we breathe in.**

To help students visualize the structures that enable plants to exchange these gases with the environment, let them use hand lenses to get a closer look at the illustrations or have a microscope and leaves available.



## FORMATIVE ASSESSMENT

### MAKING SENSE OF PHENOMENA

Students gain understanding that water, nutrients, and air are basic plant needs as they explore the **investigative phenomenon**. They should connect this to the **anchoring phenomenon** that hydroponic systems provide plants with all their basic needs, which do not include soil. Students should understand that plants cannot be healthy without water, nutrients, and air.

**REMEDIATION** If students struggle to connect the **investigative phenomenon** back to the **anchoring phenomenon**, have them list all of the things that have found out in the Exploration about what plants need to stay healthy and grow (water, nutrients, and air). Review the list with students, and point out that the list does not include soil.

### SOCIAL EMOTIONAL LEARNING

Before students answer the question, discuss as a class what it means to give constructive feedback. Talk about how feedback should include the positive aspects of student work as well as helping others improve upon their work without being mean or disrespectful. Provide students time to practice this with a partner or small group before answering the question.

### MAKING SENSE OF PHENOMENA IDEA ORGANIZER

After completing Exploration 3, students can fill in the **Idea Organizer** to summarize the connection between plants needing water, nutrients, and air to grow and the anchoring phenomenon that hydroponic systems provide plants with their basic needs (which do not include soil).