



Plant Doctor

Grade Kindergarten

Standards

GPS S1L1
NGSS 1LS1A; 1LS1D

Time

4-8 periods of 45 minutes – 1 hour each

Supplies

Per student

- Assortment of edible plant parts to dissect
- 1 Cake servers with serrated edge per group of 4 students
- flowers students may harvest from garden
- Scissors
- Wilted plant
- Plant with insect damage

Garden Connection

Students will pick flowers and fruits from the garden to dissect and will identify unhealthy plants to “treat.”

STEM Connection

Students may use QR codes to create a field guide for the garden.

Overview

Students will view a time lapse movie of a fruit developing from a flower; agree on a working definition of a fruit; dissect and examine plant parts; and adjust their definition of fruit based on their investigation. Then students will examine unhealthy plants in the garden and write prescriptions to make them better; discuss their diagnoses and prescriptions; and argue from evidence about what a plant needs to survive.

Essential Question

How can I grow healthy plants? What can I do to help plants that are unhealthy or do not have the resources they need to live?

Engaging Students

Just as medical students dissect dead animals to learn anatomy and how to be doctors, students who are studying to be Plant Doctors will dissect plants to identify parts and to observe healthy and unhealthy plants.

Exploration

Students will diagnose and treat unhealthy plants; look for evidence that plants respond to outside influences;

Explanation

Students will argue from evidence to explain plant needs,

Environmental Stewardship

Students will analyze plant stressors in the garden or schoolyard and take action to protect plants or restore them to health.

Evaluation

Students will demonstrate proficiency by completing the prescription pad activity and/or the coloring sheet activity, correctly identifying at least three of a plant’s survival needs.

Extension

Students may create a field guide to plants in the garden.

Standards

Georgia Performance Standards in Science

S1L1. Students will investigate the characteristics and basic needs of plants and animals.

- a. Identify the basic needs of a plant.
 1. Air
 2. Water
 3. Light
 4. Nutrients
- c. Identify the parts of a plant—root, stem, leaf, and flower.

Next Generation Science Standards

1-LS1.A: Structure and Function

All organisms have external parts. . . . Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

1-LS1.D: Information Processing

. . . . Plants also respond to some external inputs. (1-LS1-1)

Teacher Background Information

In addition to a plant’s basic needs: water, light, nutrients and carbon dioxide from air, healthy plants also need to be free from disease and harmful pests, to have the opportunity to reproduce with other plants of the same species, and to avoid being eaten.

Students may gain a better understanding of how plants grow and how flowers result in fruit by watching any of these time lapse films:

Simulated apple time lapse film: http://www.youtube.com/watch?v=sEwmUbzN_-g

Dragonfruit time lapse: <http://www.youtube.com/watch?v=UW2yS7uQ1zw>

Zucchini squash time lapse: <http://www.youtube.com/watch?v=ocB578GARk8>

Pear time lapse <http://www.youtube.com/watch?v=zVNsCW6eiiw>

Clay-mation flower to fruit time lapse simulation

<http://www.youtube.com/watch?v=dD9wUpen6I4>

The original ‘Plant Doctor’ coloring sheet is available at the HM Coloring Pages web site:

<http://www.hmcoloringpages.com/free-printable-coloring-pages/tigger-playing-plant-doctor/#!prettyPhoto/0/>

For assistance in diagnosing unhealthy plants, see these web resources:

What’s Wrong with My Plant? <http://www.extension.umn.edu/garden/diagnose/plant/>

Plant Nutrient Deficiency Images: <http://asktheplant.com/?p=833>

Plant Nutrient Deficiency Poster: <http://www.atlantishydroponics.com/blog/category/gardening-tips/plant-nutrients/>

Teacher Preparation

Grow an assortment of flowers and/or edible plants in the school gardens, and let students harvest flowers, fruits and vegetables for the dissection portion of this lesson. It will also be necessary to allow students to observe plants in the garden (or in pots) that demonstrate wilting, overwatering,

bug infestation, lack of light, lack of nutrients, or other symptoms of unhealthiness. Another way to do this is to transplant five identical plants from the garden to pots and bring them into the classroom a week before the lesson, allowing students to devise a “fair test” that will compare the effects of lack of water, air, light, and nutrients to the health of a control plant that receives all of those things.

PROCEDURES FOR LESSON ACTIVITIES

Day 1: 45 mins - 1 hour

Engagement

Show students several time lapse films of fruit developing from flowers, such as these: [apple](#) simulation, [dragonfruit](#), [zucchini](#), [pear](#), [clay fruit](#). After watching the films, divide students into small groups of approximately four and ask them to agree on a definition of a fruit. Record each group’s definition. Then provide each group with three fruits harvested from the school garden (or grocery store), such as banana, apple, bell pepper, squash, strawberry, blueberry, pear, avocado, or eggplant – without telling students that all are fruits. Equip students with plastic cake servers with serrated edges (free from grocery store bakeries) to cut with, and demonstrate safe cutting techniques (fruit flat on table, cake server cutting down towards table, fingers curled out of the way). Ask students to investigate their plant parts inside and out, and to apply their earlier definition to decide whether each part is a fruit. Let each group show their plant part and tell the class whether it is a fruit. Encourage students to ask each other what evidence or proof supports their conclusions. Allow students to revise their definitions of fruits, as necessary. Ultimately, students should reach a consensus that a fruit is a plant part that grew from a flower and contains seeds for making new plants.

Day 2: 45 mins - 1 hour

Exploration

To grow good fruit (or other edible parts) for students to eat, a plant must be healthy. Take the students to the garden to observe three unhealthy plants. Ask students to observe each plant and write a prescription for something the plant needs to live. Discuss student diagnoses and prescriptions. Then ask students to figure out what plants need to survive. Students should be encouraged to challenge each other by asking for the evidence or proof each answer is based upon.

Direct students to observe ways in which plants respond to external influences. What are external influences? These could include any factors outside the plant, including possible predators; disease; wind, water and sunlight; other plants nearby; extreme temperatures; etc. For instance, mimosa trees and “sensitive plants” close their fringy leaflets when touched; most plants turn their flowers to face the sun as it moves through the sky; vines reach out for external objects to use as supports and close their tendrils around those objects to climb; stems form abscissions at the points where leaves fall off, so they will not lose water; plants such as goldenrod grow galls around insects or fungi living on their stems; plants that are shaded grow their stems in the direction of light; seeds and bulbs that are planted upside down sense which direction is up; tree bark grows around fence wire and other injuries caused by objects touching or tied around trees; plants cut their leaves off from water, causing them to wilt, to protect the main stem, when water is critically low; plant roots grow deeper when there is no water at upper levels of soil; leaves close their stomata with guard cells when it is too hot, so they will not lose too much water from these pores (only visible with 400x microscopes or higher); etc. (In addition, plants respond to external stimuli with internal parts, such

as producing hormones when they sense they are being preyed upon, and producing fragrances to attract pollinators; but these actions are not covered by this NGSS standard).

Day 3: 45 mins – 1 hour

Explanation

Discuss the student diagnoses and make a list of all the prescriptions. Do they include all the things plants require to survive? Take suggestions and add to the list until it includes water, sunlight, air, space, and nutrients. Note that nutrients are not food for a plant, but are necessary ingredients for a plant to grow and make its own food (just as humans need vitamins in addition to needing food).

Day 4 – 8: 45 mins – 1 hour per week, on a recurring schedule

Environmental Stewardship

Students will observe problems in the garden and offer solutions. For example, they may look for an aphid infestation on plants in the garden or in other landscaped areas of the school, and remove these garden pests by any organic means (picking them off, spraying them with water, releasing ladybugs or green lacewings in the garden to eat them, using a non-toxic insecticidal soap spray, etc.). Alternatively, students may make watering cans from empty gallon milk jugs and revive a wilting garden by watering on a regular schedule; interplant flowers among fruit and vegetable crops to attract pollinators; or identify other plant health issues and identify a role students can play in contributing to plant health.

Evaluation

Students will demonstrate proficiency by correctly identifying four of a plant's survival needs. The [prescription pad](#) activity and/or the coloring sheet activity can be used to assess this competency. Student will demonstrate knowledge of parts of a plant by dissecting and explaining the parts.

Extensions

Students may make a field guide to the garden or schoolyard that illustrates or explains how plants respond to external stimuli. First, use popsicle sticks to place numbers next to plants that illustrate something the class wants to spotlight; then create a written garden guide with comments related to the plants at each numbered location. Alternatively, QR codes may be posted in the garden and scanned to show student work.



Name: _____



Credit: Hm free printable coloring pages

Draw 4 things a plant needs to live. List 4 things a plant needs to live:

1) _____

2) _____

3) _____

4) _____

Write a prescription for a sick plant.



Rx

Doctor Name: _____

Prescription for (Plant Name):

Plant Address:




Diagnosis (what is wrong):

Prescription (what plant needs to get healthy):



Assessment for Plant Doctor

Student Name(s): _____ Date: _____

<p style="text-align: center;">Level of Mastery</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">→</p> <p style="text-align: center;">Benchmark or Performance Measure</p>	 <p style="text-align: center;">EMERGING Not yet proficient 1 point</p>	 <p style="text-align: center;">COMPETENT Partially proficient 4 points</p>	 <p style="text-align: center;">PROFICIENT Mastered task 5 points</p>	<p style="text-align: center;">TOTAL POINTS</p>
<p>Student diagnoses an unhealthy plant in a way that reveals knowledge of these major plant survival requirements: light, air, water and nutrients, and may even be able to identify external factors that adversely affect plant health</p>	<p>Student identifies less than four survival requirements of plants.</p>	<p>Student identifies plant needs as air, water, light and nutrients as basic plant needs on the coloring sheet or prescription pad.</p>	<p>Student identifies plant needs as air, water, light and nutrients and can also identify solutions for plants that appear to lack one or more of these. Student may also be able to identify factors that adversely affect plant health like extreme temperatures, predators and garden pests.</p>	
<p>Student dissects and identifies at least four parts of a plant and may be able to explain the relationship between flower and fruit</p>	<p>Student identifies less than four parts of a plant (stem, root, leaf, flowers)</p>	<p>Student identifies at least four parts of a plant (stem, root, leaf and flower) and may be able to define a fruit as a plant part with seeds to grow a new plant</p>	<p>Student identifies five parts of a plant (leaf, stem, root, flower, fruit) and can define a fruit and explain the relationship between flower and fruit</p>	
<p>Student has drawn four things plants need to survive and/or written four things plants need to survive</p>	<p>Student draws and lists less than four parts of a plant (stem, root, leaf, flowers) (Note: Any combination of drawings and words should be counted)</p>	<p>Student draws or lists four parts of a plant (stem, root, leaf, flowers)</p>	<p>Student draws and lists four parts of a plant (stem, root, leaf, flowers)</p>	