

What Do Plants Need?



Focus: Students identify and investigate life needs of plants.

Specific Curriculum Outcomes

Students will be expected to:

- 46.0 identify and investigate life needs of plants and describe how plants are affected by the conditions in which they grow [GCO 1/3]
- 16.0 predict based on an observed pattern [GCO 2]
- 10.0 make and record observations and measurements [GCO 2]
- 32.0 follow safety procedures and rules [GCO 2]
- 11.0 construct and label concrete-object graphs, pictographs, or bar graphs [GCO 2]
- 47.0 distinguish between useful and not useful information when answering a science question [GCO 2]
- 22.0 identify and suggest explanations for patterns and discrepancies in objects and events [GCO 2]
- 30.0 respond to the ideas and actions of others and acknowledge their ideas and contributions [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- plan a simple experiment (a fair test) to investigate plant needs
- explain how to grow a healthy plant from a seed

NOTES:

Attitude Outcome Statements

Encourage students to:

- willingly observe, question, and explore [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Student Magazine, pages 12–17 • <i>What Is the Inquiry Process?</i> poster • BLM <i>Plant Needs Investigation: Plan</i> • IWB Activity 6 Literacy Place • <i>Plantzilla</i> (Read Aloud –Synthesizing Strategy Unit)	• a variety of non-toxic, untreated seeds for display (e.g., bean, radish, pea, carrot, lettuce, popcorn, pumpkin, sunflower, peach) • students' Science Journals • digital camera (optional) • pumpkin seeds and/or purple peacock pole beans and/or seeds of other fast-growing plants for student investigation • clear self-sealing baggies • paper towel • small watering cans • measuring cups • soil • water • cardboard boxes • tape • vinegar • compost • fertilizer • polystyrene cups • spoons and shovels for planting • egg cartons • seedling trays • craft supplies such as construction paper, scissors, and glue • sealed seed packets for a variety of plants • modelling clay	• Search online for digital images of a variety of plants, including healthy and unhealthy ones. • Ensure you have plants growing at a variety of stages for students to use in their investigations.	• germinate • germination • sprout • seedling • photosynthesis • fair test • variable

Safety

- Some seeds are toxic. Remind students to use appropriate senses (not taste) when exploring objects.
- If students use small metal trowels or other tools for planting, remind them to use care when doing so.
- Be aware of any allergies to seeds, nuts, or other samples you may plan to bring into the classroom.

Science Background

- **Plant needs:** Plants need air, food, space, sunlight, and water to grow. But different plants need different amounts of each. For example, a willow tree will soak up almost 400 litres of water each day, whereas a potted cactus needs to be watered only about once a week or less to thrive, although they can survive for much longer without water if necessary.
- **Fair testing:** To ensure their results are meaningful, scientists plan their experiments to ensure they are fair tests. In a fair test, all variables (factors) in the experiment except one are kept constant. In this way, scientists ensure that differences they observe among trials are the result of the one variable that is changed in a controlled way. For example, if students want to test how adding vinegar to soil affects plant growth, they must have at least two plants growing in which everything is the same: soil type and amount, seed type, depth of planting, amount of sunlight, amount of watering, etc. The only change is that they will add vinegar to one sample and not the other. To be sure they are conducting a fair test, students must first identify all the factors that will affect plant growth or germination (whichever they are testing), and then ensure they manipulate only one.

Possible Misconceptions

- Students may believe that plants absorb all of their food from soil. In fact, their main food is glucose, which they make themselves via photosynthesis, in which carbon dioxide and water react to form oxygen and glucose. The green pigment chlorophyll facilitates the reaction, which requires energy from sunlight to proceed. Plants absorb water from soil, and also additional nutrients such as nitrogen and phosphorus. Remind students that one of the main differences between plants and animals is that plants make their own food.
- Students may believe that any source of light will keep plants alive. Ensure that at least one group is investigating the question about whether and what type of light plants need.

ACTIVATE



Anchor Video Review

Share the Anchor Video: *Plant Growth and Changes* (see the Teacher's Website) and review with students the needs of plants.

From Seed to Plant

Display a variety of non-toxic, untreated seeds (e.g., bean, radish, pea, carrot, lettuce, popcorn, sunflower) and have students predict what type of plant each will become. The following seeds are pictured on page 12 of the Student Magazine: sunflower seeds, corn kernels, kidney beans, lemon seeds, pumpkin seeds, and apple seeds. Have students practise observing and recording by describing and sketching different seeds in their Science Journals.

Share and discuss pages 12–13 of the Student Magazine with students. Ask:

- **Have you ever planted a seed?**
- **What happened?**
- **What did you do to make sure the seed sprouted into a plant?**
- **How did you take care of the plant?**

Tell students they will be investigating how plants grow and develop from a seed to an adult plant. Introduce the term “germination” (the sprouting of a seedling—a young plant—from a seed) and record this word on the Word Wall. Record any questions students may have on the I Wonder Wall.

Observing Germination

Place several popcorn kernels or bean seeds in a clear, self-sealing baggie, along with a moistened paper towel. Have students predict what will happen to the seeds. Then place them in a warm, sunny location. Check on the seeds each day and, if possible, take digital photos to record the germination process.

Healthy Plants, Unhealthy Plants

Tell students they will be investigating plant needs. Ask:

- **What do you need to be healthy?**
- **What do plants need to be healthy?**
- **How are plant needs the same as ours? How are they different?**
- **What might cause plants to be unhealthy?**

Record students' ideas on the board. Show images of a variety of plants sourced online, including healthy plants and plants that are unhealthy due to lack of sunlight, water, or other factors including disease. Ask students what visual clues tell them whether a plant is healthy or unhealthy.

CONNECT



Plant Needs Investigation, Part 1

1. Ask a question. Make a plan.

Introduce pages 14–15 of the Student Magazine to the students. Allow students time to read the text then, as a class, brainstorm different factors that might influence the germination and growth of plants. Ask:

- What do seeds need to germinate?
- What do plants need to grow?
- What happens if they do not get what they need?

Factors to discuss can include soil type, as well as amount of water, air, space, and sunlight. Define “photosynthesis” and add this word to the Word Wall. Students can also consider how the addition of fertilizers, compost, or other substances such as baking soda or vinegar to the soil might affect growth. Adding vinegar is a way to model a more acidic environment, while adding baking soda makes the soil more alkaline (typical of clay soils). On the board, record the main points from the discussion and any questions that arise.

Review the steps of the *What Is the Inquiry Process?* poster. Then tell students that they will be doing an investigation into plant needs. Explain the concept of fair testing. In science, a fair test is one that changes only one variable, keeping all other variables the same. This ensures that any differences noted among trials are a result of the one changed variable. For example, if students are testing the effects of adding different substances to soil, then other variables, such as seed type, amount of sunlight, type of soil, amount of watering, etc. must be kept constant.

Have students form groups. In their groups, they should use the discussion and questions on the board to frame a testable question about what plants need to germinate and grow to investigate. Visit the groups and help them with their question as necessary. Sample questions are as follows:

- Do seeds need water to germinate?
- How does temperature affect the germination of seeds?
- How does depth of planting affect the germination of seeds?
- Do seeds need soil to germinate?
- How does the number of seeds planted in one container affect growth?
- Do plants grow better in sunlight or darkness?
- Do all plants require the same amount of water to grow?
- How much water do plants need to grow?
- How does soil type affect plant growth?

After the question is framed, have students design a fair test to answer their question. Students can use BLM *Plant Needs Investigation: Our Plan* to structure their design. Students should include a prediction about what they expect to observe.



Approve the plan before students carry it out, ensuring that safety procedures and rules are included as appropriate. Students should list all materials that they will need. (A variety of seeds, seedlings, and healthy plants should be available for groups to study.) Take note of any materials you do not have so that they can be available on the day students begin their investigations.

2. Explore. Record your results.

Students can now follow their plans and carry out their investigations. Help students with their investigation set-up. Students should record their observations in their Science Journals, including descriptive observations, measurements, and sketches. They can also take photographs each day to record what they observe. Discuss with students what measurements and observations are important to answering their question. Students can measure plant height, count number of leaves, count the number of seeds that germinate and record on what day germination occurs, note plant colour (significant in experiments with sunlight and as a way to gauge plant health), and so on.

Note: This investigation is carried through into the next teaching plan as students continue to make measurements and observations, record their results, analyze their results, and draw simple conclusions.

A “Brown Thumb”

Tell students that you have a friend who is terrible with plants and cannot manage to keep them alive. Instead of a green thumb, he has a brown thumb! Describe different things your friend does and ask students to predict what would happen to the plants based on the observations they have been making. For example, he

- tries to grow plants in a dark closet
- forgets to water them for weeks
- waters them five times a day
- “waters” them with cola
- tries to grow plants in pebbles instead of soil
- keeps houseplants outside in the winter
- plants his seeds 1 metre deep in soil
- scatters his seeds across soil without covering them up

Taking Care of Plants

Share pages 16–17 of the Student Magazine with students and ask:

- **What do the plants in this greenhouse need?**
- **How are the plants’ needs being met?**

Have students reflect on what they have learned through their reading and plant needs investigations in preparation for communicating the results of their investigations to the class.





Literacy Place Connection:

Read aloud *Plantzilla* by Jerdine Nolen and David Catrow. Ask:

- What made Plantzilla special?
- What were Plantzilla's needs?
- How did Mortimer care for Plantzilla?
- What did he do to meet Plantzilla's needs?
- How did Plantzilla react to Mortimer's care?

CONSOLIDATE

IWB Activity:

- Challenge students to identify the environments where plants would thrive using Activity 6: *Where does it thrive?* (see the Teacher's Website).



The Happy Gardener

Have students create a booklet or slide show giving advice to novice gardeners about what plants need to be healthy. Students can include tips, labelled illustrations or digital photographs, and a list of "Do's and Don'ts." They can also provide anti-examples describing what might happen if plants' needs are not met.

Plant Needs Game

Provide craft materials for students to make a Plant Needs board game. For example, factors contributing to plant health could be listed on cards or on labelled spaces. Factors such as "sunlight" and "water" move the players forward, and negative factors such as "polluted soil" and "too much fertilizer" move them back.

How to Grow

Present students with a seed packet and allow time for them to read the instructions. Based on the information on the packet, as well as the knowledge gained in their experiments, through class discussion, and in their own experience and research, have students describe orally how they would plant the seeds and care for the growing plants, including safety precautions they would take.

EXPLORE MORE

Fertilizers

Have students research how and why different kinds of fertilizers are used for different kinds of plants. Students can also investigate potential harm involved in using fertilizers, as well as comparing the pros and cons of using homemade compost and commercial fertilizers.

Unusual Needs

Have students ask questions and investigate plants that have unusual needs compared to other plants. For example, why do carnivorous plants such as pitcher plants need to consume insects? Why do willow trees need so much water? Why do cacti and other desert plants need so little?

Plant Needs Investigation: Our Plan

Names: _____

Our question: _____

Our prediction: _____

Our plan: _____

What we will need: _____

The safety rules we will follow: _____

Plant Needs Investigation: Our Plan (Continued)

Names: _____

Here is a sketch of how we will set up our investigation:

Teacher signature: _____