

THINKING AND ACTING LIKE A SCIENTIST

TEACHER'S GUIDE

Plant Design

How do the different parts of plants help them survive and grow?

GRADE 1

Life Science





Plant Design

Grade Level/ Content	1/Life Science
Lesson Summary	In this lesson, students will learn how plants survive, grow, and meet their needs.
Estimated Time	2, 45-minute class periods
Materials	plants or photographs of plants: rose, cactus, Venus Fly Trap, and Flypaper Trap, Investigation Plan , Observation Form , journal
Secondary Resources	How Do Plants Defend Themselves? (The World of Plants) by Ruth Owen Plant Growth (The Life of Plants) by Louise Spilsbury and Richard Spilsbury From Seed to Plant by Gail Gibbons How Do Plants Defend Themselves (video) Carniverous Plants (video)
NGSS Connection	1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
Learning Objectives	<ul style="list-style-type: none">• Students will identify how plants defend themselves from predators.• Students will understand how plants grow and change.• Students will provide evidence that different plants have different ways to protect themselves, grow, and meet their needs.
Cross-Curricular Project Connections	Design a Plant, Animal Design

How do the different parts of plants help them survive and grow?

There are many different types of plants. Some are flowering plants, and others are non-flowering. Some plants, such as wheat and apple trees, are used as food sources for humans. Plants need certain things to help them grow and survive. While one plant might need a lot of water to survive, other plants, such as cactuses, have adaptations that allow them to survive with little water.

In this lesson, students will observe different plants to determine how they grow, survive, and protect themselves. They will also learn to recognize and describe similarities and differences of plants.

Investigation is based on the Van Andel Education Institute (VAEI) Instructional Model for Inquiry-Based Science.

In all investigations:



Students don't know the "answer" they are supposed to get.



Students play a driving role in determining the process for learning.



Teachers and students construct meaning together by journaling.



Students are working as hard as the teacher.

Part 1

INVESTIGATION SETUP

Arrange a set of the four plants (or plant photographs) for students.

- Rose plant or photograph
- Cactus plant or photograph
- Venus Fly Trap or photograph
- Flypaper Trap (*Pinguicula gigantea*) or photograph
- [Investigation Plan](#)
- [Observation Form](#)
- Journal

Part 2

INVESTIGATION FACILITATION



Question

Introduce the investigation question.

How do the different parts of plants help them survive and grow?

CURIOSITY

Ask students to name a plant they are familiar with. Ask students if they think their plant has to be able to defend itself. Discuss how some plants have defenses to protect them from predators. Next, introduce the investigation question.



Personal Knowledge

Students capture what they already know about plants.

- Provide an opportunity for students to discuss openly what they already know about plants. Listen for misconceptions that can be addressed and corrected during the lesson. (*Examples of common misconceptions are that plants need milk to grow, plants “eat” their food, bigger plants are healthier, plants get their food/energy through their roots, and plants are not alive.*)
- Write a KWL chart on the board. Ask students for their help filling out the first column (what they already know).
- Next, ask students for their help filling out the second column (what they want to learn).
- Leave the chart on the board during the investigation. Explain to students that they will revisit the chart at the end of the lesson to see if their questions have been answered.

RISK-TAKING

Add all ideas, even misconceptions, to the KWL chart. If something is questionable, place a question mark next to it and explain that students should try to learn more about that concept during the investigation. Giving students opportunities to be “wrong” and learn from it is the only way to build a culture that supports risk-taking.

Investigation Plan

Students investigate different types of plants to determine how plant structures help the plant grow and/or survive.

- Introduce the plants or plant photographs.
- Divide students into groups of 3 or 4 and give each group the [Investigation Plan](#).
- Explain to students that they will be observing four different plants to determine how they grow, survive, and meet their needs.
- Remind students that this is a group activity, and all group members need to be active participants.
- Show students the [Observation Form](#). Discuss each section of the form, and explain to students that they will complete the form as they view each photograph. Have groups rotate through all four plants.
- Challenge groups to use the photographs to identify different characteristics about the plants.

OPENNESS TO NEW IDEAS

Students may not have experience thinking about how plants use their parts. Encourage them to explore the ideas by asking questions within their group. For example: *Which part would help this plant get food? Which part would help it avoid being eaten by animals? Which part would help it stand tall instead of fall over?*

CRITICAL THINKING

Use the [Fair Test](#) checklist to help students think critically about the investigation plan. Help them understand that a good investigation plan must include a test that is repeatable, generates quality data, and minimizes error. The more critically students think about their investigation plan, the more confident they can be in their results.

INVESTIGATION PLAN
PLANT DESIGN

1. Circle the plant your team is investigating on the **Observation Form**.
2. Look at the parts of the plant.
3. Talk with others in your group. Decide how the plant uses its parts to grow and survive.
4. Write or draw your ideas on the **Observation Form**.
5. Rotate to another plant and repeat steps 1-4. Use a different **Observation Form** for each plant you observe.
6. Join with another group. Compare your observations.

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Investigation Plan

OBSERVATION FORM
PLANT DESIGN

NAME: _____
DATE: _____

Plant Type (Circle One):

Rose Cactus Venus Fly Trap Flypaper Trap Other: _____

What parts help it grow?	
What parts help it survive?	
How does it meet its needs?	

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Observation Form



Observation

Students record their observations.

- Using the **Observation Form**, have students observe and record their thoughts on how each plant grows, survives, and meets its needs. They may use words or drawings.
- Encourage them to record qualitative (thorns, sticky, etc) data.
- Have students join with another group to compare observations.



Data Analysis

Students make sense of their data by organizing it and representing it visually.

Have students analyze their data. They may wish to use the [Data Analysis](#) prompt as a guide.

- Have students **evaluate** their data for trustworthiness.
- Then, have them analyze their data to find patterns and trends. (Students should look for plant parts that are recognizable and similar in all four plants). They may **organize** the data and/or **represent** it visually to construct meaning.
- Have students **interpret** what the identified patterns or trends mean.
- Ensure they have enough data that it can be used as evidence to support a claim.



Secondary Knowledge

Students use secondary sources to help determine more about how plants grow, survive, and meet their needs.

- Use these resources (or your own) to help develop students' understanding of how plants grow, survive, and meet their needs.

[How Do Plants Defend Themselves? \(The World of Plants\)](#) by Ruth Owen

[Plant Growth \(The Life of Plants\)](#) by Louise Spilsbury and Richard Spilsbury

[From Seed to Plant](#) by Gail Gibbons

[How Do Plants Defend Themselves](#) (video)

[Carniverous Plants](#) (video)

After reviewing the various videos, students should understand that many plants have natural defenses from predators, some of which can't be seen. They should recognize that plants need water and other nutrients to survive, and they use their parts to obtain these nutrients. They should also understand that plants have parts that help them reproduce and grow.

PERSEVERANCE AND CURIOSITY

Use these secondary resources during and after the investigation as appropriate. If students had success using their photographs to discover how each plant has parts to help it survive, then use the resources after the investigation to satisfy their curiosity about other plants. If the students struggled with using the photographs to observe the plant parts, use these resources to encourage persistence.



Explanation

Students write a claim and provide evidence and reasoning to support it.

- Have students use what they've discovered from their analyzed data to write an explanation that answers their investigation question. Students may wish to use the [Explanation](#) prompt as a guide. Have them write their explanation in their Lab Journal.
- Have students develop a **Claim** to answer the question: How do the different parts of plants help them survive and grow?

Continued

- Then, have them add **Evidence** (the analyzed data) to support their claim.
- Finally, have them add **Reasoning** to their claim. Reasoning should include the information obtained from this investigation as well as science principles they have learned.

Claim

Plants have parts that help them defend themselves from predators.

Evidence

A rose plant has thorns to prick humans or animals that might hurt it. The Venus Fly Trap can trap flies and other insects by closing around them.

Reasoning

Investigation: Different plants have different parts and ways to defend themselves from predators, so we get the things they need to survive, and to grow. We looked closely at the plant photograph and observed different plant parts. We compared our results with those of another group. They wrote some of the same observations that we wrote.

Science: We learned from readings and class discussion that plants have external features to help protect themselves. Some of these features can be seen and others can't.

- Once the explanation is written, have students discuss their results using a [Present and Defend](#).

DISCOURSE

Have students conduct a [Present and Defend](#) to develop presentation skills, as well as audience participation. Research teams present a summary of their investigation to the class. The class analyzes the information presented and asks clarifying questions, challenges and/or supports the arguments made, and even presents alternative explanations as appropriate. Research teams defend their explanation with evidence and reasoning. If students are doing the same investigation plan, choose 1 or 2 groups to share.



Evaluation

Students reflect on the investigation.

- Ask students how confident they are in their results.
- Ask students what question they would like to explore further about plant structures.
- Have students look again at the KWL chart discussed before they completed the investigation. Ask them to complete the chart by discussing the third column (what they have learned). Encourage students to compare what they list in this column to what they already knew and wanted to learn. Focus especially on discussing and explaining any misconceptions that had question marks placed next to them at the beginning of the lesson.

**Application**

Students demonstrate understanding of plant designs by using what they have learned in multiple contexts.

Have students use what they learned about protective plant structures to design a solution to a human problem that mimics how plants use their parts to survive, grow, and meet their needs. For example, students might design clothing or equipment to protect bicyclists by mimicking acorn shells.

Extension

Extend students' understanding of plant and animal structures by observing plants and animals that use external structures to capture and convey different kinds of information (*for example, a butterfly mimicking eyes on wings*) and those that use external structures to respond to information they receive from the environment (*for example, a chameleon changing color*).

Assessment

Evaluate each group's explanation on how well students:

- identify how the plants in the photograph defend themselves from predators.
- demonstrate an understanding of how the plants use their body parts to grow and change.
- provide evidence that different plants have different ways to protect themselves, grow, and meet their needs.

Take This Lesson Across the Curriculum

Design a Plant

Students show an understanding of how plants survive and grow by designing their own plant.

Reading/Language Arts	Math	Science	Social Studies
Plant Synopsis Students write a short description that explains their invented plant design. CCSS.ELA-LITERACY.W.1.2	Number That Step Students will use ordinal numbers when writing their plant synopsis to order their steps. CCSS.MATH.CONTENT.1.NBT.B.2	Design a Plant Students use their knowledge of how plants survive and grow by designing their own plant. NGSS: 1-LS1-1	Find That Cave Students will make a map to identify the places their engineered plant lives. NCSS: D2.Geo.2.K-2

Animal Design

Students identify parts on an animal that help them survive.

Reading/Language Arts	Math	Science	Social Studies
Animal Survival Read <i>Survival at 40 Below</i> by Debbie S. Miller and Jon Van Zyle, and discuss how animals in the tundra survive the brutal cold. CCSS.ELA-LITERACY.R.L.1.	Temperature Students will help create a data chart of various animals and the average temperatures of their habitats. CCSS.MATH.CONTENT.1.MD.C.4	Animal Parts Students use their knowledge of animals to draw a picture of a chosen animal and its parts. They will label the parts that help them survive. NGSS: 1-LS1-1	Where Does That Animal Live? Students use a map to help locate where their chosen animal lives. They will discuss how certain parts of the animal help it adapt to its environment. NCSS: D2.Geo.2.K-2

For additional lessons or to customize this lesson, go to www.nexgeninquiry.org.

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OBSERVATION FORM

PLANT DESIGN

NAME: _____

DATE: _____

Plant Type (Circle One):

Rose

Cactus

Venus Fly Trap

Flypaper Trap

Other: _____

What parts help it grow?	
What parts help it survive?	
How does it meet its needs?	