

Lesson Title: What Nutrients Do Plants Need?

Grade Level: 9-12

Subject Area: Horticulture

Duration: 80 minutes

Standards Addressed: CTE Agriculture and Natural Resource Standards C2.1, C10.4, F2.4, F6.1, F6.2, F6.3, G6.2

Activity/Lesson Objectives:

- Students will explain how fertilizers impact the environment and why overuse can be harmful.
- Students will compare different types of fertilizers and their uses.
- Students will identify essential nutrients for plant growth and recognize signs of nutrient deficiencies.
- Students will recommend appropriate fertilizers to address specific soil nutrient deficiencies.

Engagement Activity: Hunger Signs in Plants (10 minutes)

Materials:

- [Hunger Signs in Plants Google Slides Presentation](#)
- Optional Video: <https://www.youtube.com/watch?app=desktop&v=pgF7dVmqVL4>

Procedure:

1. Begin by introducing the activity: *“Since ancient times, people have used plant appearance to understand plant health. Plants communicate through distress signals, and today we’re going to be plant detectives to learn what those signals can tell us.”*
2. Explain that plants can show symptoms for many reasons, including water, light, temperature, and nutrient issues. Briefly introduce nutrient deficiencies and toxicities as possible causes.
3. Display each plant image one at a time. Ask students to carefully observe the leaves, noting any clues that indicate stress or poor health. Encourage them to think about what might be causing the problem without needing to make a final diagnosis.
4. Facilitate discussion using guiding questions:
 - What clues do the leaves, stems, or roots give about this plant’s health?
 - Which environmental factors (like light, water, or temperature) might be causing these symptoms?
 - How could we test whether the problem is due to a nutrient deficiency or something else? What would you do next?
5. Conclude the activity by emphasizing that careful observation helps identify plant needs and lays the foundation for better decision-making in horticulture.

Explore: Soil Nutrient Test (20 minutes)

Materials:

- Soil samples
- Soil nutrient test kit (e.g., [Luster Leaf Rapitest Kit](#))
- [What Nutrients Do Plants Need? Lab Worksheet](#)

Guiding Questions:

- How do nutrients in soil affect plant growth?
- What happens when soil lacks key nutrients?

Procedure:

1. Begin by introducing the activity: *“Today we’re going to test soil to see which nutrients it has and which it may be missing. By the end, you’ll understand more about your soil’s health and how that affects plant growth.”*
2. Divide the class into groups of three and provide each group with a soil sample and nutrient test kit. Have them prepare their sample by mixing soil with water, then use the kit to test for nitrogen (N), phosphorus (P), and potassium (K). Students should follow the kit instructions carefully, compare their results to the color chart, and record the data on their [What Nutrients Do Plants Need? Lab Worksheet](#).
3. After testing, students will describe their soil sample, identify which nutrients are sufficient or lacking, and consider how that might affect plant growth.
4. Wrap up with a class discussion where groups share results and reflect on which fertilizers could improve their soil. Highlight the importance of balance: too little fertilizer can limit growth, while too much can damage plants and the environment.

Explain: What Nutrients Do Plants Need? Presentation (30 minutes)

Materials:

- [What Nutrients Do Plants Need? Google Slides Presentation](#)
- [What Nutrients Do Plants Need? Guided Notes](#)

Procedure:

1. Begin by reviewing the slideshow and ensuring familiarity with the content. Hand out the guided notes to each student.
2. As you present each slide, pause periodically to allow students to fill in their guided notes. Highlight key points, provide additional context, and encourage student interaction by asking questions or prompting discussion.

3. At the end of the slideshow, review the key concepts covered in the presentation. Go over the notes with the class, ensuring that students have accurately filled in their guided notes.

Evaluate: Solving Nutrient Problems (20 minutes)

Procedure:

1. Introduce the task: *“Now that you’ve tested your soil, it’s time to use your results to make a recommendation. Imagine you’re advising a homeowner on how to fix a nutrient problem. Which fertilizer would you suggest?”*
2. Ask students to review their soil test data and identify whether their sample shows a deficiency or toxicity. Have students predict the plant symptoms that would appear if the deficiency or toxicity were left uncorrected.
3. Instruct students to research and identify one organic and one inorganic fertilizer that could address the issue. Remind students to check the nutrient content of each fertilizer and avoid recommending products that add nutrients already abundant in their soil.
4. Ask students to consider sustainability: What could happen if these fertilizers were over-applied, and how might that affect the soil or environment over time?
5. Have students record their recommendations in the “Assessment” section of the [What Nutrients Do Plants Need? Lab Worksheet](#) and provide a written explanation connecting their soil test results to their fertilizer choices.

Criteria for Success:

Review the student assessments. Assign one point for each criterion the student successfully meets, unless otherwise noted. The assessment is for a total of 10 points.

- ___ Identified nutrient deficiency or toxicity from soil test results (1 pt)
- ___ Linked soil data to at least one correct plant symptom (1 pt)
- ___ Recommended one organic fertilizer appropriate to the soil’s needs (1 pt)
- ___ Recommended one inorganic fertilizer appropriate to the soil’s needs (1 pt)
- ___ Explained why each fertilizer was chosen, tied to soil test results (2 pts)
- ___ Considered sustainability: explained what happens if too much fertilizer is applied (e.g., leaching, runoff, plant damage) (2 pts)
- ___ Responses are clear, complete, and use correct vocabulary (1 pt)

Background References:

[Maggie's slideshow on fertilizers](#)

[Russell's slideshow on nutrient deficiencies](#)

[More Fertilizer slideshow on whole unit.](#)

Key Vocabulary: Deficiency, toxicity, primary nutrient, secondary nutrient, micronutrients, Nitrogen, Phosphorus, Potassium, organic fertilizer, inorganic fertilizer, complete fertilizer