



Plant Doctor – Challenges with Growing Plants

Middle School Food and Agricultural Literacy Curriculum

Precepts

- J. Mental Growth
 - J1. Think critically
 - J2. Think creatively
 - J3. Solve problems

National Standards

- NRS.02.01.01.a. Identify hazards associated with the outdoor environment.
- NRS.02.06.09.a. Describe climatic factors that influence natural resources.
- CS.02.04.01.c. Demonstrate critical and creative thinking skills while completing a task.
- CS.02.04.02.c. Implement effective problem solving strategies.
- NL-ENG.K-12.5 – Communication Strategies
- NS.5-8.3 – Life Science
- NS.5-8.5 – Science and Technology

Student Learning Objectives

- As a result of this **unit** the students will...
- Discuss technologies and methods related to plant production.
- As a result of this **lesson** the students will ...
- Identify challenges related to growing plants.

Content Outline

Objective 1. Identify challenges related to growing plants.

- I. **Five challenges to growing plants:**
 - A. Insects: Some insects can damage or even destroy crops.
 - B. Nutrients: Plants need certain nutrients to stay healthy and productive.
 - C. Weeds: These are plants that compete against the plants you want to grow.

Time

Instruction time for this lesson: 45 minutes.

Resources

Herren, R.V. (2007). *The Science of Agriculture: A Biological Approach*. Clifton Park, NY: Delmar Learning — National FFA Organization. (2009). *LifeKnowledge Online*. Retrieved July 9, 2009, from <http://agedlearning.org>

Tools, Equipment, and Supplies

- Overhead projector/transparencies
- Writing Surface
- Various Healthy and Unhealthy Plants
- MS.PS.5.3.TM.A – one per teacher
- MS.PS.5.3.TM.B – one per teacher
- MS.PS.5.3.AS.A – one per student
- MS.PS.5.3.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in ***bold italics***:

Insects

Weather

Nutrients

Weeds

Disease

- D. Disease: Pesky bacteria, viruses, fungi, and other things that kill your crop.
- E. Weather: What happens when the weather is out of our control but is a big factor in growing crops!

Interest Approach

As students walk into class, let them see a number of different plants sitting at the front of the room. One plant would be sufficient, but if you have access to a variety of plants, including a food producing plant, an ornamental plant, a healthy plant, and a plant that is struggling, display them.

Hello everyone! You may have heard people say, "Man! Sarah sure does have a green thumb." Certain people are really good at keeping plants beautiful and healthy.

Add a personal story about your own green thumb. You can relate it to the plants you brought to class.



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As you can tell, some of these plants are doing really well, and others are not.

Adapt according to your examples.

What are some hypotheses you have about how well or poorly these plants are doing?

Elicit student responses.

Now you are thinking like agri-scientists. All of those are very valid possibilities.

How many of you feel like you have a green thumb? Raise your hand. Whether you have a green thumb or not, raising plants can be a pretty tough task. Growing plants is a huge part of our planet! Plants across the globe feed, clothe, medicate, and shade us. I hope the people growing those plants have green thumbs!

Whether you have a green thumb or not, growing plants can be very challenging. We've already learned a lot about plants, but today we're going to look at the challenges of raising plants. Whether you are planting a great garden for your house or feeding the world, you need to be aware of the challenges associated with growing plants.

Today you will learn what the five major challenges of growing plants are and in order to try out your green thumb detective skills, you will do your best to solve a few plant problem puzzles.

Summary of Content and Teaching Strategies

Objective 1. Identify challenges related to growing plants.

Utilize **MS.PS.5.3.TM.A** as an overview of content.

To get started, we'll start with some Green Thumb 101 training. This will be your crash course in detecting problems with plants that are growing. You'll use this crash course to figure out some plant puzzles. Here is your plant puzzle field guide.

Distribute **MS.PS.5.3.AS.A** to each student.

Utilize the Crayon e-Moment®.

There are five major challenges that anyone faces who grows plants. As we discuss each one underline each of the major challenge words. For example highlight **insects**, **nutrients**, and so on. The major challenges are:

Insects: Some insects can damage or even destroy crops.

Nutrients: Plants need certain **nutrients** to stay healthy and productive.

Weeds: These are plants that compete against the plants you want to grow.

Disease: Pesky bacteria, viruses, fungi, and other things that kill your crop.

Weather: What happens with the **weather** is out of our control but is a big factor in growing crops!

In order to get all the information you need to figure out some plant puzzles, you are going to form plant problem assessing teams. When I say PLANTS we will form groups of three that are sitting together and eagerly waiting for more instructions. PLANTS!

Help students break into groups. You can break students into groups more purposefully if you feel it is necessary. Some strategies would be grouping by those near you, pre-group the students before the activity, or hand out different plant seeds (one type for each group formed), and have students find students with the same seed to form the groups.

Great. In just a minute you will begin preparing for the plant doctor competition where your group will be working to figure out the plant mystery before the other groups do. This will require that you work hard to learn all you can in the 10 minutes you have to review the plant doctor guide. What questions are there? The person wearing the most green, come up and get your plant doctor guide. You have 10 minutes to study that guide starting now.

Refer students back to **MS.PS.5.3.AS.A** and be available to keep students on task and answer any questions. Give students time benchmarks at five minutes, two minutes and one minute remaining.

Time is up. Now it is time to see how well you can deal with the challenges of growing plants.

Utilize **MS.PS.5.3.TM.B** as an overview of content.



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Now that you are an expert on overcoming plant growing challenges, we are going to put your skills to work in thinking critically and being a problem solver. I will give you a scenario, and your task is to figure out exactly what happened that led to the plant problem. The only way you can do this is by asking yes or no questions that lead you to the root of the problem.

You are trying to figure out what the problem is in the given scenario. You cannot ask if it is a **weed**, **insect**, **weather**, **disease**, or **nutrient** issue. I will take the questions and give the answers. If you want to solve the mystery, your whole group must stand and explain your answer. If you are not correct, you are out of the round and cannot answer again.

What questions are there?

Let's start with the first scenario:

Note to instructors: This activity is really designed to cause dissonance as students strive to figure out the issues. Feel free to give hints or alter the information given to help students find the answers. You have the freedom to be very strict or not in regards to the answers given.

Your job is to only answer yes or no. The point is for students to continue to look for clues to find the root of the cause. Take the liberty to direct the students as much or as little as you think necessary, depending on their success. The scenarios match what they read in their doctor reference guide. After they solve the scenario, explain any details the students may have missed or expand on the scenario information if you desire.

Scenario 1:

A farmer drives out to his or her field of corn and finds a small section of six-foot-tall corn that is lying on the ground. What happened, plant doctors?

Answer to Scenario 1:

There was a section of the cornfield that was infected by insects, the European Corn Borer. The insects have just recently started infecting the field, and they began in this small spot. The night before there was a storm that came through, but there was nothing except strong winds in the storm. The combination of the wind and the insect damage caused the corn to lay over.

Scenario 2:

A local organic farmer plants a large section of potatoes this year. The potato plants seem to grow as expected but when he begins to dig up the potatoes to harvest them, he doesn't find any potatoes. What could have happened?

Answer to Scenario 2:

During the time when the potatoes were to bloom and form, a hail storm came through the area and knocked the blossoms off the potato plants. The farmer realized the plants had been hit, but when they bounced back and continued to grow, he thought they were fine. Unfortunately, without the blooms, the potatoes didn't develop.

Scenario 3:

A teacher at your school decides that she is tired of her room looking so boring. She decides to grow her own plants so the class can watch them grow and also make her room more appealing. She plants a few flowers, an ivy vine that grows up the window and a small spider plant that hangs from the ceiling near the window. The plants seem to do well at first, but later they wilt easily and have some funny colored spots on them. Why is her green thumb not so green?

Answer to Scenario 3:

The teacher used soil from her house for all the plants. This soil was low in potassium, which caused the plants to develop a purple tint. The potassium deficiency presented further problems when the plants did not receive sufficient water, and this low potassium caused diseases. There were also white and yellow stripes found in the leaves. The plants didn't do well with the changing temperature in the room.

Scenario 4:

A family gets really excited to grow corn in their back yard this year. They work a piece of soil, plant the corn and work very hard every day to make sure it has all it needs to grow. There are some **weeds** on the outskirts of the garden, but they aren't taking water or sun from the corn. Their friends, who live in the city, are already harvesting beautiful ears of corn, but their corn plants aren't producing beautiful ears of sweet corn. What happened?



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Application

Extended classroom activity:

To extend this lesson, you could try to schedule a trip to a nearby nursery, agricultural field, or golf course and have someone discuss and show the students the challenges they face with the plants they work with.

You could also work with your school's groundskeepers and have them take the students on a tour of the campus with the purpose of discussing what precautions the school takes to maintain healthy plants around the school.

FFA activity:

Many CDE events like agronomy, forestry, horticulture, and floriculture landscaping involve identifying insects, diseases, and nutrient deficiencies. You could have students participate in a contest that furthers their learning of overcoming plant challenges.

SAE activity:

Any students who work with plants as a part of their SAE could explain the challenges they have faced. Students could also bring in examples of plant problems for the class to try to figure out.

Evaluation

MS.PS.5.3.ASS.ESS.A.

Answers to Evaluation

1. Insect Damage
Nutrient Deficiencies
Weather Conditions
Weeds
Diseases
2. C
3. B
4. D
5. A

Answer to Scenario 4:

This family lived in the country and when they dug up a piece of ground, seeds from a weed called Johnson Grass were able to grow. The weeds look a lot like corn and they never cut them down. During pollination, the Johnson Grass cross-pollinated with the corn which caused the corn to not produce ears of sweet corn. Their friends in the city didn't have to deal with Johnson Grass.

Scenario 5:

The FFA chapter has a golf tournament every year. This year is especially hot; it has rained a lot and it is very humid outside. All the teams line up to get started and you are in the cart going to the first hole. You hit a beautiful shot up onto the green, and as you walk to put it in, you notice large discolored round areas on the green. This could really mess up your winning putt! What in the world is going on?

Answer to Scenario 5:

The problem is a fungus or disease that kills and thins out the grass. The fungus is most active when it is warm and very humid. Conditions are perfect this year. The fungus grows really fast when grass is highly fertilized with nitrogen.

Great job thinking like an agri-scientist! What you just did is exactly what agriculturalists around the world do every day as they face challenges growing plants! Turn to the person next you and tell them, "What an expert!"

Now that you are experts, let's look at the plants I brought to class again.

Review/Summary

What do you now see or think after learning about the challenges of growing plants? Do we have any ideas of why these plants look the way they do?

Discuss all the options of the challenges the plants face as a review of the content.

The next time you see a plant that is wilting, a field of corn that isn't as tall as it should be, or a tomato that has brown spots, you'll know what some of the problems are with that plant. I hope you will also appreciate how much work it takes to keep plants alive and healthy.



There are five major challenges that anyone faces who grows plants. They are:

Insects: Some insects can damage or even destroy crops.

Nutrients: Plants need certain nutrients to stay healthy and productive.

Weeds: These are plants that compete against the plants you want to grow.

Disease: Pesky bacteria, viruses, fungi, and other things that kill your crop.

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Plant Doctor Field Guide

Tips for Identifying Insect Damage:

- Many times plants will show obvious damage from insects eating the leaves or fruit.
- Sometimes insects damage the parts of plant that you can't see like the stems or the roots.
- Damage to the stems and roots not only slow down the growth but also affect the plant's structure.
- When insects move from plant to plant they can also carry diseases to various plants.

Tips for Identifying Disease Damage:

- Plants may appear wilted or have colored spots on the leaves, stems, or fruit.
- Many times you will find a white powdery substance on the leaves.
- Certain viral and bacterial diseases discolor the entire plant.
- Plants with diseases are usually smaller and don't grow as well.
- Sometimes moisture in the soil and the temperature cause diseases to form under the ground on the roots or underground fruit.
- Remember that many times insects can transfer diseases.

Tips for Identifying Nutrient Damage:

- Plants' main nutrients are Nitrogen, Phosphorous, and Potassium.
- Nitrogen is key for plant growth and development. It helps the plant make chlorophyll, which produces a pretty green plant. A lack of Nitrogen makes the plant yellow and stunted.
- Phosphorous is important for producing seeds. It also helps develop strong roots. A lack of Phosphorous causes the plant to have a purple color

- Potassium is important in helping a plant resist diseases and changing weather conditions. Without enough Potassium, plants will appear to have burned tips and may have yellow or white streaks on the leaves.

Tips for Identifying Weed Damage:

- Weeds compete for the resources that are important for plants to grow. They use water, can shade the plants from sun, use valuable nutrients, and can spread disease.
- Some weeds can cross-pollinate with your crop causing a plant to not produce fruit.
- Weeds spread quickly by spreading their seeds.

Tips for Identifying Weather Damage:

- Too much water can cause plants to not have enough air in the soil. Not enough water causes plants to wilt.
- Storms that bring high winds, hail, floods, or cold temperatures can affect the plant's ability to produce fruit or grow properly.
- Sometimes storms can affect the pollination of plants by damaging the flower.
- Cold weather and freezing during the growing season can kill many plants.
- Sometimes weather conditions can promote disease.
- Storms can make it difficult for people to tend to their crops.



Name: _____

1. List the five major challenges of growing plants.

2. If a plant is small and looks yellowish, it probably has _____.

- a. Been attacked by insects.
- b. Been over watered.
- c. A nitrogen deficiency.
- d. A phosphorous deficiency.

3. If you see a white powdery substance on a plant, it most likely _____.

- a. Has been infected by the European Corn Borer.
- b. Has some type of disease.
- c. Has been covered in pollen from a weed.
- d. None of the above.

4. How can weather affect the growing of plants?

- a. Too much rain can cause plants to not get enough air in the roots.
- b. Hail can disrupt plant pollination.
- c. Cold temperatures during the growing season can damage plants.
- d. All of the above.

5. Insects can damage plants by eating plant tissue, but they also can _____.

- a. Spread plant diseases to other plants.
- b. Use water that the plant needs.
- c. Cause a nutrient deficiency by eating the nutrients.
- d. Attract birds that eat the plants.