

Introduction to Plant Systems (8007)

Teacher Resources

FFA Information

The National FFA is an organization dedicated to preparing members for leadership and careers in the science, business, and technology of agriculture. Local, state, and national activities and award programs provide opportunities to apply knowledge and skills acquired through agriculture education.

For additional information about the student organization, see the [National FFA website](#) and the [Virginia FFA Association website](#).

The following leadership development events are available for this course:

- [Agricultural Issues](#)
- [Conduct of Chapter Meetings](#)
- [Creed Speaking](#)
- [Employment Skills](#)
- [Extemporaneous Public Speaking](#)
- [Parliamentary Procedure](#)
- [Prepared Public Speaking](#)

The following career development events are available for this course:

- [Agricultural Technology and Mechanical Systems](#)
- [Agronomy](#)
- [Floriculture](#)
- [Forestry](#)
- [Nursery/Landscape](#)

Instructional Scenarios

Introducing Botany I

Scenario:

Makayla, an agriscience student, was learning about food labels in her agricultural education class. She learned that Congress passed the National Bioengineered Food Disclosure Standard in 2016 and that this required the U.S. Department of Agriculture (USDA) to establish a labeling standard for genetically

modified (GM) or bioengineered (BE) food. These requirements were originally set to take effect by July 2018, but the USDA extended the implementation two years after a public comment period. On December 20, the USDA released the official law, which they will implement at the beginning of 2020 and require food companies to comply by January 1, 2022. Makayla’s homework assignment required her to visit a local grocery store to find food product labels and observe the information on food labels on a variety of products. She needed to find information that included the GMO/BE text; symbols, or electronic or digital link, phone number, or internet URL, on the product packaging to reflect the product was produced using genetic engineering. She found two labels that had the following images.



Big Question: What is a GMO or bioengineered food? What do the images mean?

Focused Questions:

- What is genetic engineering?
- What types of plants/crops could be a GMO?
- Why would companies inform consumers that a product is a non-GMO or contains no GMOs (e.g., a can of peaches, a plum, even a bottle of water)?
- Why are GMOs necessary to feed the growing population, especially with limited resources such as water and land?
- What are the big controversies surrounding GMOs?
- How can marketing influence a consumer’s decision when selecting products that are GMO/BE or partially produced with genetic engineering?
- What are the labeling requirements for bioengineered foods intended for human consumption?
- What types of GMOs do not have labeling requirements?
- Why are food labels important?

SOL Correlation: BIO.5

Project-Based Assessment:

Have students create their own “GMO” and label. This is a role-play scenario. Students will research and explore the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service’s role under the Plant Protection Act. Research how the Food and Drug Administration under the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act regulate GMOs in food, drugs and biological products. Determine the types of restrictions on GMOs in the United States, costs associated with the creating a GMO, researching marketing plans, testing procedures and protocols prior to marketing the product, marketing implementation, patent(s), and product approval, etc. Students can then create their GMO and present their GMO to a panel of judges for evaluation.

Introducing Botany II

Scenario:

Mya has two planting beds in front of her home that are 4x12 feet each. She spent a significant amount of money preparing the soil and planting flowers she selected for her planting beds last year. While her garden beds provided the beautiful color scheme she wanted and bloomed prolifically throughout the summer season, Mya was extremely disappointed to learn that the flowers she had selected died out and did not return the following year. This year, Mya wants to ensure her garden bed investment will provide her with more bang for her buck. She would like to select plants that will provide her with the colorful garden she desires, flowers throughout the season, and will return the following year, or even procure plants that provide color year-round. What types of plants should Mya be looking for and what does she need to consider prior to selecting the plants she wants to add to her garden bed?

Big Question: What are the growth cycles, light, and soil requirements of different plants?

Focused Questions:

- What are annual plants and why would one consider the selection of annuals?
- What is a perennial plant and why would one consider the selection of perennials?
- What is a biennial plant?
- What is shade tolerance and how does it influence plant selection?
- Why are a plant's light requirements important when considering plant selection?

SOL Correlation: BIO.1, BIO.2

Resources:

Flower and vegetable planting guide

Understanding Plant Process

Scenario:

Abby is considering constructing a planting bed around two Red Maple trees in her front yard. The area receives sunlight for about half to three-quarters of the day, depending on the season. The temperature is warm during the day and cool at night. The ground stays wet and holds a great deal of moisture.

Big Question: What are the primary concerns Abby must take into consideration to ensure that the plants she selects are able to be successful in the environmental conditions mentioned in the scenario?

Focused Questions:

- What are the plants' light requirements?
- What are the plants' moisture requirements?
- What plant structures are involved in photosynthesis? In respiration? In water transport?
- How do plants store energy?

- Should Abby devise a watering system and/or schedule?

SOL Correlation: BIO.1, BIO.2

Resources:

Flower and vegetable planting guide

Evaluating the Environmental Stimuli that affect Plant Growth and Development

Scenario:

Ashley wants to start a garden so she can grow food to eat and develop healthier eating habits. She has researched relevant information to develop sound plans for growing cool season plants from seed, to include cabbage, lettuce, onion bulbs, carrots, and radishes. She lives in the mid-Atlantic area of the United States and has discovered in her research that the types of plants she has selected can be planted in early March, if the winter is mild. While planting and observing the plants as they develop, she starts to think about cultivating additional crops to include, tomatoes, cucumbers, and peppers. In April, she purchases and plants the additional crops and is eager for them to bloom. One day, while at work, Ashley receives a frost advisory for her area. She needs to figure out what to do to prepare her plants for the frost so that they will survive.

Big Question: How does temperature affect plant growth and development across various plant types?

Focused Questions:

- Will the potential frost affect all Ashley’s plants or just some?
- What preventive measures can Ashley implement to protect the crops vulnerable to the frost and cooler temperatures?
- How can temperature affect biochemical reactions?
- What are the differences between cool-season and warm-season crops?
- What is hardening off?
- What are some symptoms of excessive cold or heat?

SOL Correlation: BIO.1, BIO.2

Resources:

Plants

Seeds

Growing manual

Evaluating the Environmental Stimuli that Affect Plant Growth and Development

Scenario:

Jeremy works in the school's greenhouse as part of his Supervised Agricultural Experience (SAE) program. He noticed a couple of plants located on the back of a shelf, growing at an angle. He also observed that these plants had longer and thinner stems than others of the same variety in the greenhouse, and he is wondering what might have caused the plants to develop in this way.

Big Question: What could have caused the plants to develop in this way and how do plants respond to different light conditions?

Focused Questions:

- What is *phototropism*?
- What is *photomorphogenesis*?
- What is *photoperiodism*?
- Why is the sensing of light important to plants?
- What colors of the light spectrum do plants better absorb?
- What is the role of light absorption in plant development and reproduction?

Project-Based Assessment:

Experiment- or research-based project

Presentation

Resources:

Agriscience Fair

Different LED lights (e.g., red, blue, purple, white)

Demonstrating Methods of Asexual Propagation in the Production of Plants

Scenario:

Gloria's grandmother has a spider plant that is perfectly mature and has little babies (plantlets). Her grandmother asked her to help distribute the little baby plants to her cousins as gifts for the upcoming holidays. Now, Gloria needs to figure out how to do this with cuttings.

Big Question: How does one reproduce plants through cuttings?

Focused Questions:

- How should she make her cuttings?
- Should she use a rooting hormone?
- What size pot should she use?
- What are the sanitary procedures to follow when taking cuttings?
- What determines the type of cutting to be taken?
- How should one care for new cuttings?
- What is a rooting hormone?
- When is the best time to transplant cuttings?

SOL Correlation: BIO.1, BIO.2

Resources:

Garden tools

Mature spider plants with plantlets

Potting soil

Plant containers

Managing Plants: Soil and Soilless Growing Systems

Scenario:

Farmer Ben has a 10-acre plot of cropland that he has been farming for eight years. During this time, the field has had below average yields when compared to his other fields. To solve the problem, Ben has decided to take a soil sample to identify the plot's soil type; the percentage of macronutrients and micronutrients present in the soil; the soil's pH; and the types of amendments he may need to improve the soil's condition to meet the nutrient requirements of the types of plants Ben would like to cultivate.

Big Question: How is a soil's nutrient content and pH evaluated?

Focused Questions:

- Why is soil testing important?
- How does one collect a soil sample?
- How does one prepare soil for testing?
- Why are macronutrients and micronutrients important to plant growth?
- What role do macronutrients and micronutrients play in plant growth and development?
- What is the ideal pH range for soil?

SOL Correlation: BIO.1, BIO.2

Resources:

Buckets

Soil auger

Soil test box

Trowels

Investigating the Principles of Plant Nutrition

Scenario:

Chris is growing corn as part of his Supervised Agricultural Experience (SAE) project. As he surveyed the field, he noticed in one section of the field that the leaves on the young corn plants were not the normal green but were appearing purplish in color. Chris took some photos to assist him in determining the problem with the corn plants.

- The soil in this section of the field is a sandy loam. The soil in the other sections of the field is a sandy-clay loam mixture.
- A soil test was taken, and amendments were added in the fall based on the recommendations for corn nutrient and planting requirements.
- This has been a very wet spring.

Big Question: What could be causing the young corn plants to be turning a purple color?

Focused Questions:

- What are the symptoms of macronutrient deficiencies?
- What are the symptoms of macronutrient toxicities?
- How can you prevent macronutrient deficiencies and toxicities?
- What are some causes of macronutrient deficiencies and toxicities?
- What is soil compaction and how can this contribute to nutrient deficiency symptoms?

Project-Based Assessment:

Presentation comparing macronutrient deficiencies and toxicities, and recommendations for correcting the problem(s).

Managing Plants: Soil and Soilless Growing Systems

Scenario:

Lindsey would like to convert a portion of her parents' property into a pasture for horses and goats. About seven years ago, the property (about 30 acres in size) was clear-cut. The trees were a mixture of deciduous and pine. Lindsey and her parents subsequently removed all the brush from the site, and this past fall, her parents hired someone to grind up the stumps so a tractor would be able to drive over the area without difficulty and be able to brush hog the site. The site was sprayed with an herbicide to remove greenbriers and other weeds that have been growing on the site since it was clear-cut, and it has not been fertilized in the past five years. It is predominantly flat with a gentle slope where one can drive a tractor across the hill without difficulty. Lindsay has discovered that the soil type is a combination of sand, sandy loam, clay, and a sandy clay loam.

Big Question: How should one collect a soil sample for evaluation and determine if the site is suitable for developing a pasture for horses?

Focused Questions:

- How often does one need to have soil tested?
- When and how should soil be sampled?
- What tools should one use for a soil test?
- What is the proper soil depth for a soil test?

- How many sub-samples should one collect from each area?
- What should be done if an area shows poor crop growth?
- Should soil samples be dry? Why or why not?
- How much soil is needed for each composite sample?
- Where can one get the sample box and materials for testing?
- Where should one send the soil sample for testing?
- What information needs to be included with the sample?
- How long will it take to get the results of a soil test?
- How much does a soil test cost?
- Does it matter what one plans to grow/produce in the plot being tested?
- What are the qualities of a good pasture?

SOL Correlation: BIO.8

Resources:

USDA plant hardiness zone map

Seed packet(s)

Crop planting guide

Soil sample box and soil sampling/information sheet from local VA Cooperative Extension Service

Using Basic Scientific Skills and Principles in Plant Selection

Scenario:

Troy, an FFA member, has decided to raise vegetables and fruits to sell at the local farmer’s market for his Supervised Agricultural Experience (SAE) project. His parents are allowing him to use their land, located in Southeastern Virginia. He tested the soil on the plot where he is planning to plant his garden and added the recommended soil amendments. The topsoil is a sandy loam, and the subsoil is a sandy clay loam. Troy would like to grow beans, corn, tomatoes, cucumbers, and watermelons. He is worried because he does not have access to water at this location.

Big Question: How should Troy determine if the crops he wants to plant would be successful at this site?

Focused Questions:

- What types of plants can Troy cultivate based on his plot’s location?
- What types of plants will grow well based on the plot’s soil type and drainage?
- How can Troy use the USDA plant hardiness zone map to assist him with planning his garden?
- What information should Troy research to assist him in deciding what crops and when to plant?
- Why is it important to plant crops during a specific time range?
- What other factors are important in determining the types of crops Troy should plant and why?

SOL Correlation: PS.2, ES.1, ES.6

Project-Based Assessment:

Student presentation that includes design garden layout of plants and planting times including spacing