

Plant and Horticultural Sciences

Cluster Big Idea:

- Sustaining and enhancing life through the contributions made by plant science and horticulture.

Cluster Enduring Understandings:

- Plant life is dynamical.
- Plant science and horticulture are global economic systems.
- Human decisions and choices affect the sustainability of plant life.
- Plants serve a multifaceted role to sustain or improve the quality of life.

Cluster Essential Questions:

- What is horticulture?
- What is plant science?
- How are plant science and horticulture global economic systems?
- Why is plant life considered a dynamic process?
- How is the development of life skills supported by plant science and horticulture?
- In what ways do plants affect the quality of life?

Standard Statement: Students will study the principles and techniques used in the management of plant systems.

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Performance Element PHS.01: Identify and classify plant materials.		
Performance Indicator PHS.01.01: Classify plants and use recognized taxonomic nomenclature.		
Basic	Proficient	Advanced
<p>Recognize the importance of binomial nomenclature.</p> <p>Create botanical mounts.</p> <p>Understand the differences between annual, biennial, and perennial plants.</p> <p>Understand the terms monocot and dicot.</p>	<p>Identify and use binomial names for plant materials and translate those names into common names for plant materials.</p> <p>Identify the differences between monocots and dicots.</p>	<p>Prepare a self-guided tour of school grounds that explains both the binomial and common names of plant materials in the area.</p> <p>Design and implement a school garden or arboretum.</p> <p>Select crops and plants according to accepted market specifications.</p>

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Performance Element PHS.02: Understand plant anatomy and physiology.		
Performance Indicator PHS.02.01: Understand cell structure.		
Basic	Proficient	Advanced
Identify and label plant cell structures. Recreate a plant cell structure through drawings. Identify and define cell structure terminology. Describe the role of the scientific method in horticultural research.	Demonstrate fluid movement in cells. Compare the cell types and structures of various plant materials. Complete an experiment to observe the various stages of cell reproduction.	Design an experiment that demonstrates cell turgor pressure and various growth and plant maturity stages.
Performance Indicator PHS.02.02: Identify various plant structures and systems and their functions.		
Basic	Proficient	Advanced
Identify the various parts of the plant (i.e., root, stem, leaf, and reproductive structures). Describe the role of the scientific method in horticultural research.	Explain the physiological importance of the various plant structures. Understand the interrelationship of plant structures.	Design and conduct a research project related to plant science.
Performance Indicator PHS.02.03: Understand plant processes.		
Basic	Proficient	Advanced
Define terminology associated with various plant processes (e.g., photosynthesis, transpiration, and respiration). Recognize the chemical equations associated with plant processes. Describe the role of the scientific method in horticultural research.	Discuss the importance of the various plant processes. Explain the interrelationship of plant processes. Describe factors that influence plant processes.	Design and conduct an experiment to demonstrate a plant process.

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Performance Element PHS.03: Demonstrate propagation techniques for various plant materials.		
Performance Indicator PHS.03.01: Identify sexual and asexual reproduction plant processes.		
Basic	Proficient	Advanced
<p>Understand the difference between asexual and sexual propagation.</p> <p>Identify methods of asexual propagation.</p> <p>List factors that affect plant processes.</p> <p>Describe the role of the scientific method in horticultural research.</p> <p>Explain the basic principles of genetics and their role in plant production.</p> <p>Explore the effects of plant propagation methods on the global market.</p>	<p>Explore and understand seed germination.</p> <p>Demonstrate how factors affect plant growth.</p> <p>Discuss the importance of biotechnology in improving plant genetics and production.</p> <p>Explore the outcome of genetics and heritability in plants.</p>	<p>Analyze data related to seed germination.</p> <p>Design and conduct an experiment related to plant genetics or biotechnology.</p> <p>Demonstrate tissue culture techniques and aseptic techniques.</p> <p>Discuss and debate methods of plant propagation and their effects on the global market.</p>

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Performance Element PHS.04: Understand the concepts of horticultural pest management.		
Performance Indicator PHS.04.01: Identify horticultural pests.		
Basic	Proficient	Advanced
Examine types of horticultural pests (e.g., insects, weeds, and rodents). Define terminology associated with horticultural pests.	Collect, identify, classify, and display various horticultural pests. Identify the effects of pest damage on horticultural crops.	
Performance Indicator PHS.04.02: Understand the importance of horticultural pest control.		
Basic	Proficient	Advanced
Identify the various methods of horticultural pest control. Define terminology associated with horticultural pest control. Identify the indicators of a horticultural pest infestation. Explore the effects of horticultural pest management on the environment.	Explore and discuss the various methods of horticultural pest control [e.g., chemical, physical, biological, and integrated pest management (IPM)]. Outline a horticultural pest control program. Understand pesticide safety procedures.	Implement horticultural pest control procedures for plant production areas. Develop an integrated horticultural pest management plan for a given crop. Demonstrate pesticide safety procedures. Discuss and debate horticultural pest management as it relates to the environment.

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Performance Element PHS.05: Perform cultural practices related to the production and maintenance of horticultural crops.		
Performance Indicator PHS.05.01: Understand the physical properties of soil and other growing media.		
Basic	Proficient	Advanced
Identify types of growing media. Describe the components and structure of soil.	Discuss alternative choices for growing media (e.g., greenhouse mixes and hydroponics).	Discuss and debate the importance of soil management and erosion control (e.g., conservation and land use).
Performance Indicator PHS.05.02: Understand the chemical relationship between plants and soil.		
Basic	Proficient	Advanced
Identify irrigation practices. Identify the basic nutrients needed for plant growth. Understand the purpose of soil fertilization. Understand the various nutrient deficiencies in plants.	Explain how plant nutrients behave in soil. Demonstrate irrigation practices. Describe and investigate soil testing in order to determine the nutrient needs of plants. Discuss elements that are essential for plant growth. Recognize and describe nutrient deficiencies in plants.	Implement management practices to modify growing media to address nutrient deficiencies in plants. Calculate conversion factors related to soil fertilization. Develop irrigation criteria for plants.
Performance Indicator PHS.05.03: Understand how plant populations affect horticultural production.		
Basic	Proficient	Advanced
Define plant populations.	Use geometric math principles (e.g., area and volume) that are related to plant populations.	Collect and analyze data to help calculate plant populations.

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Performance Element PHS.06: Demonstrate the fundamentals of horticultural planning and design.		
Performance Indicator PHS.06.01: Demonstrate creative design skills.		
Basic	Proficient	Advanced
Identify and describe the basic principles and elements of horticultural design.	Demonstrate the basic principles and elements of horticultural design. Critique and evaluate horticultural designs by referring to design principles.	Prepare horticultural exhibits according to guidelines established for Delaware State Fair entries. Design and implement a horticultural project based on design principles.
Performance Indicator PHS.06.02: Understand plant material selection.		
Basic	Proficient	Advanced
Identify plant qualities and the proper selection of plants (based on these qualities) for use in a horticultural design.	Select plant materials based on their intended use (e.g., floral arrangement or landscape design).	Develop a horticultural design plan based on plant selection. Prepare and display market-quality plant materials for the Delaware State Fair.
Performance Indicator PHS.06.03: Identify mechanics and supplies used in the horticultural industry.		
Basic	Proficient	Advanced
Identify equipment and supplies used in the horticultural industry. Understand terminology associated with the maintenance of the horticultural industry.	Select proper equipment and supplies based on their intended use. Evaluate maintenance practices used in the horticultural industry.	Implement and maintain horticultural projects by using the proper equipment and supplies.

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Performance Element PHS.07: Understand management decisions related to horticultural operations.		
Performance Indicator PHS.07.01: Understand the horticultural industry.		
Basic	Proficient	Advanced
Identify operational organizations within the horticultural industry. Understand industry standards, grades, and inspection procedures for horticultural products.	Discuss and describe the operational organization of a horticultural business. Understand the history of horticulture as it relates to the present.	Explain the importance of the horticultural industry to present-day society. Evaluate horticultural products based on industry standards.
Performance Indicator PHS.07.02: Examine the entrepreneurial principles of the horticultural industry.		
Basic	Proficient	Advanced
Define terminology associated with entrepreneurship. Discuss the roles of employees within a horticultural business. Identify proper methods of communication used in a business setting. Identify record-keeping practices.	Demonstrate the economic principles and techniques related to the horticultural industry. Prepare a horticultural business plan. Practice proper methods of communication used in a business setting. Demonstrate record-keeping practices.	Analyze successful business practices. Analyze the financial data of a horticultural business. Implement a horticultural business plan. Help manage the communication that occurs in a business setting. Evaluate record-keeping practices and identify when to implement changes.
Performance Indicator PHS.07.03: Identify marketing strategies.		
Basic	Proficient	Advanced
Describe various marketing strategies.	Prepare a marketing plan for a horticultural business.	Analyze and evaluate a marketing plan for a horticultural business.

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Performance Element PHS.08: Develop an understanding of technological advancements in the horticultural industry.		
Performance Indicator PHS.08.01: Demonstrate an understanding of current technology.		
Basic	Proficient	Advanced
Understand technology used in the present-day horticultural industry.	Discuss technology used in the present-day horticultural industry.	Debate technology used in the present-day horticultural industry. Demonstrate the proper use of technology in horticulture. Research advancements in horticultural technology.
Performance Indicator PHS.08.02: Understand the implications of horticultural technology on the environment.		
Basic	Proficient	Advanced
Identify ways in which horticultural technology impacts the environment.	Research ways to reduce the negative environmental impact of horticultural technology.	Conduct a research project that implements a new horticultural technology.