

## CTE CONTENT AREA: Agriculture

### CONTENT MODULE TITLE: Plants in the Agriculture Industry

#### MODULE DESCRIPTION

This module introduces students to ways plants are developed, grown, and harvested for food, fiber, and fuel. Students investigate various ways plants are used in agriculture and the products, services, and issues associated with each. Students explore the wide variety of career options related to plants in agriculture and identify the knowledge, skills, education, and training necessary for success within these fields.

#### GUIDING QUESTION

What knowledge and skills are necessary to demonstrate introductory understanding of the development, management, and care of plants in the agriculture industry?

#### MODULE CONTENT

##### Plants in the Agriculture Industry

###### 1. Plants

Students will

- a) Classify plants based on their specific characteristics
- b) List and describe the components, the types, and the functions of plant including roots, stems, leaves, flowers, seeds, and fruit
- c) Identify plants by their purpose, such as floral plants, landscape plants, house plants, and crops

###### 2. Conditions and Practices for Plant Growth

Students will

- a) Explain the importance of light, air, temperature, and water on plant metabolism and growth
- b) Describe the physical and chemical characteristics of growing media and explain the influence they have on plant growth
- c) Identify the essential nutrients for plant growth and tell about the major functions of each
- d) Detail the process of photosynthesis, including the types; its stages (e.g., light-dependent and light independent reactions); its products and byproducts
- e) Tell how environmental factors affect the rate of photosynthesis
- f) Summarize the importance of photosynthesis to plant life on earth

###### 3. Plant Production

Students will

- a) Explain how farmers work with the lifecycle of plants to harvest crops for market
- b) Demonstrate plant propagation techniques
- c) Observe and record environmental conditions during the germination, growth, and

- development of a crop
- d) Monitor the progress of plantings and determine the need to adjust environmental conditions
  - e) Compare and contrast different plant production systems, such as: conventional, organic, hydroponic, and aquaponic
  - f) Identify and summarize the effects of plant agriculture on the environment, such as waste disposal, carbon footprint, air quality, and environmental efficiencies
  - g) Identify harvesting equipment and summarize harvesting methods

#### 4. Plant Products

Students will

- a) Demonstrate proper use of plants in their environment (e.g., focal and filler plants in floriculture; heat tolerant and shade plants in a landscape design)
- b) Research and evaluate programs to ensure the safety of plant products for consumption
- c) Investigate plant production for use as biofuels
- d) Investigate plant production for use as fibers
- e) Trace the distribution system for plant products
- f) Summarize the challenges involved in working with plant products and list resources available to overcome them, including equipment, tools, and technology

#### 5. Careers in Plant Science

Students will

- a) Investigate a career in plant agriculture and identify the pathways used to reach that career
- b) Assess personal knowledge, skills, and interest in careers in plant agriculture and evaluate personal suitability for these careers

## ILLUSTRATIVE ACTIVITIES by Theme Module

### Career and Community Connections

#### Hydroponic Systems

Students work in pairs to create lists of household materials that can be used to create hydroponic gardens. Pairs then reach out to community organizations for help in securing these resources. Examples might include PVC pipe, tubing, plastic bottles, plant pots, plastic gutters, gravel, and seeds. Students invite individuals from the community groups to work with them to design and build hydroponic systems using the donated materials.

### Communication and Interpersonal Relationships

#### Prepared Talks

Students prepare 4-minute speeches on current advances in plant agriculture. For example, students might research and speak on how precision agriculture uses geographic information systems (GIS) to help farmers and manufacturers make decisions about how and when to plant, grow, irrigate, harvest, and transport crops. Students may choose to participate in the related FFA Jr. "Prepared Public Speaking" event ([New York State FFA Jr. Prepared Public Speaking Contest](#)).

## **Financial and Consumer Literacy**

### Vegetables A to Z

Students list the letters of the alphabet from A to Z. Next to each letter, students write the name of a vegetable beginning with that letter. Share the lists with the class. Students investigate the consumer information provided on packets of seeds for sale, such as cost, seed origin, seed distributor, and planting, growing, and harvesting specifications. Students create model seed packets for the "Vegetables A to Z" showing accurate consumer information. Post the models on the class webpage as resources for others.

## **Health, Safety, and Wellness**

### Vascular Systems

Students work in pairs to create Venn diagrams. One student researches the vascular system of plants; the other researches the human circulatory system. Together they create the Venn diagram to relate the root and vascular systems of a plant to the human circulatory system. Students write reflections that include explanations of the roles of diffusion and active transport in moving nutrients from the soil to the plant.

## **Problem Solving and Innovation**

### Perishable Fruit Packaging

Provide students with scholarly resources that provide information on the importance of product packaging for maintaining the quality of fresh fruits during transport to market. As a class, discuss the balance amongst function, food safety, and economics in perishable fruit packaging. In small groups, students design a protective package for shipping a perishable fruit. Students present designs to the class for suggestion and revision. Groups test their designs by shipping fruit to a designated location. Evaluate the results.

## **Sustainability**

### Community Gardens

Students conduct seed germination tests to determine optimal conditions for germination rate and seedling viability and vigor. Students start vegetable seeds under these conditions and transplant them to a home, school, or community garden. Students provide plant recipients with a link to a class summary of the optimal conditions for seed germination.

## **STANDARDS ADDRESSED**

### New York State Career Development and Occupational Studies (CDOS) Standards

#### Intermediate Level

<http://www.p12.nysed.gov/cte/>

#### Standard 1: Career Development

Students will be knowledgeable about the world of work, explore career options, and relate personal skills, aptitudes, and abilities to future career decisions.

#### Standard 2: Integrated Learning

Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings.

#### Standard 3a: Universal Foundation Skills

Students will demonstrate mastery of the foundation skills and competencies

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essential for success in the workplace.

#### Common Career Technical Core Standards

<https://www.careertech.org/career-ready-practices>

#### Career Ready Practices

1. Act as a responsible and contributing citizen and employee
2. Apply appropriate and academic and technical skills
3. Attend to personal health and financial well-being
5. Consider environmental, social, and economic impacts of decisions
6. Demonstrate creativity and innovation
7. Employ valid and reliable research strategies
8. Utilize critical thinking to make sense of problems and persevere in solving them
9. Model integrity, ethical leadership, and effective management
10. Plan education and career paths aligned to personal goals
11. Use technology to enhance productivity

#### National Agricultural Education Standards

<https://www.ffa.org/thecouncil/afnr>

- CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food, and Natural Resources career pathways
  - PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.
  - PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
  - PS.03. Propagate, culture, and harvest plants and plant products based on current industry standards.
  - PS.04. Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- \* CRP .01, .02, .03, .05, .07, .08, .09, .10, .11 Standards coincide with Common Career Technical Core Standards

## RESOURCES

Cornell University

College of Agriculture and Life Sciences

Master Gardener Program

<https://gardening.cals.cornell.edu/cornell-cooperative-extension-master-gardener-volunteer-program/>

Cornell Cooperative Extension (CCE) is part of the USDA's National Institute of Food and Agriculture Cooperative Extension System. CCE is linked to Cornell University and positioned to provide best practices grounded in research-based knowledge. These practices foster the skills, knowledge, and attitudes essential for creating successful gardening experiences for households, schools, and community organizations using gardening as a tool to achieve desired outcomes.

New York Agriculture In The Classroom (NYAITC)

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[www.agclassroom.org/ny/](http://www.agclassroom.org/ny/)

This website is a partnership of Cornell University, the NYS Department of Agriculture and Markets, the NYS Education department, Cornell Cooperative Extension, and the New York Farm Bureau. Resources include the Agricultural Literacy Curriculum Matrix, lesson plans, and websites for classroom use.

National FFA

Ag Explorer

<https://www.agexplorer.com>

National FFA and Discovery Education have created a comprehensive career resource to help students explore the broad range of careers within the industry of agriculture. Students learn about agriculture careers by watching videos, exploring career pages and completing the Career Finder interactive option.

New York State FFA

[nysffa.org](http://nysffa.org)

The New York State FFA webpage offers information on events. Information on Junior Competition Events, FFA Manual, FFA Student handbook, and state contacts are available.

American Farm Bureau Foundation for Agriculture

[www.agfoundation.org](http://www.agfoundation.org)

This website offers free downloadable materials to help students develop agricultural literacy and links to other resources for classroom use. Some materials are specifically developed for middle-school students.

New York State Department of Labor

New York State Career Zone

<https://www.careerzone.ny.gov>

Career Zone is a no-cost online career exploration and planning tool developed by the New York State Department of Labor. It offers career and education information on thousands of careers, as well as, self-assessment and career planning tools. Career Zone is appropriate for users from middle school through adult.

United States Department of Labor

CareerOneStop

<https://www.careeronestop.org>

CareerOneStop is the career, training, and job search website for the U.S. Department of Labor. The website serves job seekers, businesses, students, and career advisors with a variety of free online tools, information and resources.

Association of Career and Technical Education

Career Planning Guide

[https://www.acteonline.org/wp-content/uploads/2018/02/ACTE\\_CC\\_Paper\\_FINAL.pdf](https://www.acteonline.org/wp-content/uploads/2018/02/ACTE_CC_Paper_FINAL.pdf)

Research has identified middle school as a time when students can benefit the most from career exploration, a process of building self-awareness, learning about potential careers, and developing a plan for reaching future goals.

AdvanceCTE

Middle Level Career Interest Inventory

<https://cte.careertech.org/sites/default/files/StudentInterestSurvey-English.pdf>

AdvanceCTE provides a Career Interest Inventory worksheet to use with students in helping them identify the potential matches to the 16 career clusters available to them.

Association of CTE Administrators (ACTEA)

CTE Strong Videos

<http://www.ctestrong.com>

Edge Factor has created a series of videos related to career and education that provide students with a very contemporary perspective on CTE options. Career Cluster videos provide a new look at the many career options that students have in high school and beyond.

Career and Technical Education Technical Assistance Center of New York (CTE TAC)

<http://nyctecenter.org/>

The Career and Technical Education Technical Assistance Center (CTE TAC) operates under a state contract to assist the New York State Education Department (NYSED) in carrying out its mission of improving the quality, access, and delivery of career and technical education through research-based methods and strategies resulting in broader CTE opportunities for all students.