

Fair Lawn Public Schools

Fair Lawn, NJ

Horticulture
CP & Honors

August

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Horticulture CP & Honors is a high school science class developed by the Fair Lawn Schools high school science faculty and aligned to the Next Generation Science Standards and correlated to the Common Core State Standards for Literacy & Math.

**Science
Department**

Fair Lawn School District

Committee Credits

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Horticulture

I. Course Synopsis

Horticulture is the study of plants for beauty, comfort and food. Students in this course will develop a knowledge base in the field of gardening and growing plants and their applications for beauty, comfort and food. A variety of instructional approaches will be augmented with guest speakers, career development opportunities, video and out-of-classroom experiences. The horticulture program is designed to emphasize lifelong learning, as well as the theory and application of techniques. Students will be exposed to specific areas of the field such as greenhouse culture, landscape gardening and construction, interior plantscaping and urban forestry.

II. Philosophy & Rationale

The study of horticulture can enable students to understand more completely the complex living world around them and how they influence this world. This course will focus on building critical thinking skills and application of knowledge. Upon completion of this course, students will become aware of how discoveries and advances in horticulture are relevant to their lives.

As individuals and as a society, we have a stake in developing scientifically literate citizens. Scientific literacy enables people to use scientific principles and processes in making personal decisions and to participate in discussions of scientific issues that affect society. A sound grounding in science strengthens many of the skills that people use every day, like solving problems, thinking creatively, working cooperatively in teams, using technology effectively, and valuing lifelong learning.

All NGSS aligned courses in the Fair Lawn Schools demonstrate a commitment preparing students to become [college and career ready](#) as well as the other guiding assumptions of the [Frameworks for Science Education](#) (NRC, 2011) and the [NGSS](#) including

- Students are born investigators;
- Science instruction should focus on core ideas and practices;
- An understanding of science develops over time;
- Science and engineering require both knowledge and practice;
- Science education must connect to students' interests and experiences; and
- Promoting equity for all students must be a focus of science education.

Additionally, all NGSS aligned courses in the Fair Law Schools integrate the three dimensions discussed in the [Frameworks for Science Education](#) and the NGSS, including

- [Science & Engineering Practices](#) which describe behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems; ([NGSS PDF](#))
- [Cross Cutting Concepts](#) which link all domains of science and provide an organizational schema for interrelating knowledge from various science fields into a coherent and scientifically-based view of the world; ([NGSS PDF](#)) and
- [Disciplinary Core Ideas](#) which focus and unite K-12 science, have a broad importance across multiple sciences or engineering disciplines or are a key organizing concept within a single discipline; provide a key tool for understanding or investigating more complex ideas and solving problems; relate to the interests and life experiences of students; are connected to societal or personal concerns that require scientific or technological knowledge; and are teachable and learnable over multiple grades at increasing depth and sophistication. ([NGSS PDF](#))

As described in the NGSS, technical writing and reading non-fiction is also a focus of our 6-12 science curricula as required by the [CCSS](#). Students are expected to think critically about data they collect or read about and then express their thoughts through text-based narratives, journal entries, short-constructed response, argument-based writing, and/or in-class discussion.

Differentiated instruction for students at different levels of achievement and specific learning needs (e.g. special education, English Language Learners (ELL), at-risk, and Gifted & Talented) is embedded in targeted scaffolding based on knowledge of each student's interests, needs, and assessment data, including, but not limited to, in class formative and summative assessments.

When deemed appropriate, department teachers will engage students in purposeful paired discussions to share information more effectively, such as the "turn and talk" (Harvey & Daniels, 2009). "Text annotation" could be used, for example to optimize reading comprehension (Daniels & Steineke, 2010).

III. Scope & Sequence

Unit 1: Plants as Food (Sept-Nov)

1. definition of horticulture (ch 1 text) and intro to class
2. plant life cycle (overview)
3. use of dichotomous keys
4. definition of “weeds;”
5. identification of weeds and deciduous trees
6. basic structures of plants, and descriptive terminology (ch 4 text)
7. concepts of biodiversity, native and invasive species

Unit 2: Plants as Ornaments (Nov-Jan)

1. photosynthesis and cellular respiration (ch 4 text)
2. transpiration (ch 4 text)
3. identification of evergreens
4. careers in horticulture (ch 2 text)
5. importance of horticulture (ch 3 text)

6. use of evergreens in holiday celebrations

Unit 3: Plants Inside (February - April)

1. propagation techniques (ch 5 text)
2. structure of seeds and flowers
3. benefits of indoor plants (ch 15 text)
4. Seeds are dormant but living, and can germinate
5. gardens can be planned using knowledge of lifecycles and other needs of plants

Unit 4: Plants in Gardens (April- June) -

1. planting for pollinators
2. importance of soil (ch 6 text)
3. pests and insects of food plants

IV. Unit Descriptions

Unit 1: Plants as Food

<p><u>Enduring Understanding</u></p> <ol style="list-style-type: none"> 1. Horticulture is the study of plants for beauty, comfort and food. 2. Plants are all around us, and have both similar and varying characteristics 3. Plants may be identified based on their characteristics 4. Plants can be eaten 	<p><u>Essential Question(s)</u></p> <ol style="list-style-type: none"> 1. How do the major parts of a flowering plant function together to cause the plant to grow, reproduce, and produce food?
<p><u>Learning Objectives</u></p> <ol style="list-style-type: none"> 1. Define horticulture. 2. Describe the plant life cycle. 3. Use and apply dichotomous keys for classification. 4. Define and identify weeds. 5. Define and identify deciduous trees. 6. Describe the structure and function of plant structures. 7. Apply the concepts of biodiversity, native and non-native species. 	<p><u>Assessments</u></p> <ol style="list-style-type: none"> 1. report on one herbaceous plant 2. fact sheet on planting bulbs and mums 3. labs 4. webquest presentation (honors only) 5. work hours (including harvest festival)
<p><u>Suggested Activities</u></p> <ol style="list-style-type: none"> 1. plant identification techniques 2. create a dichotomous key 3. webquest: value of horticulture 4. colors of food – chromatography 5. learn about watering, weeding, courtyard routines 6. pumpkin dissection 7. articles on current topics with comprehension questions 8. report on one weedy plant 9. develop fact sheet about planting bulbs and mums <p>Gardening Work</p> <ol style="list-style-type: none"> 10. weeding 11. harvesting plants 12. planting second season crops 13. planting bulbs and mums 14. turning compost 	

Current events/Issues

15. natives vs invasive species
16. biodiversity (webquest for honors)

Fundraiser

17. bulb sale
18. mum sale

Field Trip

19. Glen Rock Arboretum

New Jersey Core Curriculum Content Standards

Standard 5.1 will be addressed throughout this unit.

NGSS: *HS-LS1-2*

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification

Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

Honors Differentiation

1. 2 hours additional work
2. webquest on importance of horticulture
3. additional content on tests/quizzes

Unit 2: Plants as Ornaments**Enduring Understanding**

1. The functions of plants relate to their structures
2. Plant structures are adapted to their environments
3. Horticulture offers many career opportunities
4. Plants have cultural uses; plants and holidays

Essential Question(s)

1. What career and life skills do employers look for in horticulturalists?
2. How do the processes of respiration, photosynthesis, and transpiration work together in causing a plant to grow and reproduce?

<p><u>Learning Objectives</u></p> <ol style="list-style-type: none"> 1. Compare & contrast photosynthesis and cellular respiration as they relate to plant and animal dependence on plants. 2. Describe and experiment with transpiration. 3. Identify and define evergreens. 4. Review careers in horticulture. 5. Argue the importance of horticulture. 	<p><u>Assessments</u></p> <ol style="list-style-type: none"> 1. report on one horticultural career 2. labs 3. quizzes/test 4. powerpoint presentation on photosynthesis experiments 5. work hours
<p>Gardening Work</p> <ol style="list-style-type: none"> 6. clearing boxes 7. adding compost/manure 8. 3- install cold frames <p>Current events/Issues</p> <ol style="list-style-type: none"> 9. value of plants in ecosystem, and human systems. <p>Field Trip</p> <ol style="list-style-type: none"> 10. NY Botanical Garden ; conservatory, train show, career talk <p>Fundraiser</p> <p>Poinsettia and evergreens sale</p>	
<p><u>New Jersey Core Curriculum Content Standards</u></p> <p><i>Standard 5.1 will be addressed throughout this unit.</i></p> <p><u>NGSS:</u> HS-LS1-5, LS1-7, LS2-5</p> <p>Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]</p> <p>Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.[Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.]</p>	<p>Honors Differentiation</p> <ol style="list-style-type: none"> 1. 2 hours additional work 2. poster summarizing independent research project (on one of plant processes) 3. 3- additional content on tests/quizzes

[Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. *[Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]*

Unit 3: Plants inside (interiorscaping)

<p><u>Enduring Understanding</u></p> <ol style="list-style-type: none"> 1. Indoor plants have decorative, economic, and health benefits 2. Plants can reproduce asexually and sexually 	<p><u>Essential Question(s)</u></p> <ol style="list-style-type: none"> 1. What advantage does sexual or asexual reproduction provide to a plant? 2. What conditions are needed for good seed germination?
<p><u>Learning Objectives</u></p> <ol style="list-style-type: none"> 1. Differentiate between and apply propagation techniques. 2. Analyze and describe the structures of seeds and flowers. 3. Argue the benefits of indoor plants. 4. Describe the characteristics of all seeds. 5. Describe the uses of gardens. 	<p><u>Assessments</u></p> <ol style="list-style-type: none"> 1. survey of mall plants 2. labs 3. quizzes/test 4. webquest presentation (honors only) (on one of current issues) 5. work hours
<p><u>Suggested Activities</u></p> <ol style="list-style-type: none"> 1. tropical indoor food plants (avocado, coffee, banana, etc) 2. garbage gardening 3. vegetative and sexual reproduction 4. germination experiments 5. bulb forcing 	

6. start growing seeds for outdoor beds

Gardening Work

7. houseplant propagation
8. plan gardens for spring
9. start seeds
10. grow plants for Mother's day (polka dot or herbs)

Current events/Issues

11. organic/sustainable/ vs conventional gardening
12. GMO's

Field Trip

13. Possible visit to an herb farm/greenhouse

Fundraiser

14. sell polka dot plants for mothers day (or herb dish gardens)

New Jersey Core Curriculum Content Standards

Standard 5.1 will be addressed throughout this unit.

NGSS: HS-LS1-4, 2-4

Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. *[Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]*

Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. *[Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]*

Honors Differentiation

1. 2 hours additional work
2. webquest on current issue
3. additional content on tests/quizzes

Unit 4: Plants in gardens (outdoors)

<p><u>Enduring Understanding</u></p> <ol style="list-style-type: none"> soil and seeds are essential to the success of plants gardens need to be maintained with a variety of tasks 	<p><u>Essential Question(s)</u></p> <ol style="list-style-type: none"> What are the most common insect, weed, and disease plant pests?
<p><u>Learning Objectives</u></p> <ol style="list-style-type: none"> Apply the concept of planting for pollinators. Analyze soil and apply the importance of soil. Understand the roles of pests and insects. 	<p><u>Assessments</u></p> <ol style="list-style-type: none"> informative sign for garden labs quizzes/test powerpoint presentation (honors only) (effect of climate change on food production/horticulture) work hours
<p><u>Suggested Activities</u></p> <ol style="list-style-type: none"> soil testing garden theme planning repot house plants for (possible) sale <p>Gardening Work</p> <ol style="list-style-type: none"> plant seeds outdoors mulch beds weed maintain beds <p>Current events/Issues</p> <ol style="list-style-type: none"> colony collapse disorder importance of soil health <p>Field Trip</p> <ol style="list-style-type: none"> Hike to Weis Ecology Center <p>Fundraiser</p> <p>Sell seedlings/seed packs</p>	
<p><u>New Jersey Core Curriculum Content Standards</u> <i>Standard 5.1 will be addressed throughout this unit.</i></p>	<p>Honors Differentiation</p> <ol style="list-style-type: none"> 2 hours additional work additional content on

<p><i>NGSS HS-LS-2-8, ES-3-4</i></p> <p>Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.[Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]</p> <p>Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]</p>	<p>tests/quizzes</p>
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Culminating & Concluding (5th MP) Project

<p>The fifth marking period project will be a powerpoint portfolio of what we have learned this year. (honors portfolios will have more requirements in each category)</p>			
<p>1st mp: labeled pictures of 20 weeds (30 for honors, with scientific names) labeled diagrams of plant parts and descriptors labeled pictures of deciduous trees (20/30) how to plant bulbs how to plant mums</p>	<p>2nd mp: labeled pictures of evergreens labeled diagrams of plant structures relevant to photosynthesis, cellular respiration, and transpiration pictures of plant adaptations (with explanations)</p>	<p>3rd mp: labeled pictures of 10 houseplants labeled illustrations of 4 methods of vegetative propagation labeled pictures/explanations of photosynthesis experiments labeled pictures/explanations of germination experiments</p>	<p>4th mp: photo of your sign for your box pictures of your garden each week 10 more weeds 5 pictures of anything you liked in this class.</p>

V. Course Materials

1. Videos/United Streaming
2. Laboratory supplies and equipment
3. Computer simulations, book websites, and reinforcement applications
4. Technology: Computers, Videoscope, SmartBoard, PowerPoint program
5. The following websites from the NJDOE are available for science curriculum reference.

<http://www.nj.gov/education/aps/cccs/science/http://www.njcccs.org>

Suggested Activities & Suggested Modifications for Special Education Students, ELL Students, Students at Risk, and Gifted Students:

- **ELL/Special Education Students:**
 - Provide ELL students with short lists of essential academic vocabulary terms to assist with language development such as word walls;
 - Provide ELL students with opportunities for peer to peer interactions;
 - Explicitly teach ELL students academic language and link to main ideas;
 - Support ELL students through the use of graphic organizers, modeling, and visual aides.
 - Support special education students through the use of physical activity, modeling, role-play, dialogue, reading assignments based on ability, etc.
- **Gifted Students**

Gifted students may be challenged by asking them to form additional connections between biology, chemistry, and physics.

VI. Assessments

Each unit will have a variety of tests, quizzes, labs, projects, written homework assignments, presentations and class activities. These assessments will be geared toward the main learning objectives for each unit. In addition there will be a Midterm exam, Final exam, and Final project.

VII. Cross Curricular Aspects

Horticulture teachers will work with Algebra 1 teachers to enhance student understanding of graphing, equation calculations, and basic statistical analysis.

CCCS Literacy: Click on the link to the High School Evidence Statements to see expectations related to literacy for this unit. In addition, a focus of the course will be on the development of the [LAL standards for science & technical subjects](#).

CCCS Math: Students will be expected to perform measurement, [modeling](#), apply [algebra](#), and [geometry](#) and [statistics](#).

Interdisciplinary Connections and Alignment to Technology standards

Science classes in the Fair Lawn Public schools promote career-readiness skills related to Personal Financial Literacy (9.1) and Career Awareness, Exploration, and Presentation (9.2). Some course concepts from the Career and Technical Education Standards (9.3), but these are not directly correlated since our district is not a CTE program.

The Fair Lawn Public Schools District fosters an environment that promotes career-readiness skills in all content areas. Whereas [Career Ready Practices](#) are explored consistently, specific alignment to [Personal Finance Literacy \(9.1\)](#) and [Career Awareness, Exploration, and Presentation Standards \(9.2\)](#) are included in the district level document (below). When appropriate, the [Career and Technical Education Standards \(9.3\)](#) have been reviewed and aligned as well.

Examples: 9.2B: Career exploration in each unit of study.

In addition, every effort is made to integrate technology and engineering into our science classes. [Educational Technology \(8.1\)](#) and [Technology Education, Engineering, Design, and Computational Thinking – Programming \(8.2\)](#) standards are cross connected throughout our science programs.

Examples: 8.1A: Use spreadsheets to analyze & interpret data from laboratories, 6-12.
Use the internet to increase productivity and efficiency, 9-12.
8.1B,C: Use data to solve real-world problems, 6-12.
Use online platforms to collaborate & address global issues, 9-12.
8.1F: Collect and analyze data using internet and data simulations, 6-12.
8.2A: Become aware of the invention process, 3-5.
8.2B: Become aware of the global impacts on technology, 6-12.
8.2C: Apply the design process to pushes & pulls, K-2.
8.2D: Use tools to reduce work, K-2.

For additional detail on how these standards are integrated throughout the Fair Lawn Schools curriculum, review the Fair Lawn Public Schools District Alignment to Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix.