

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 NJSL-S and correlated to the NJSL English & Math.

**Science
Department**

Fair Lawn School District

Committee Credits

Written By

Kathy Meneghin

With Input from

Kathy Salisbury, DeVosBury Designs, Consultant

Ronald Durso, Science Supervisor

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.

II. Philosophy & Rationale

This course has been aligned to and developed with the NJSLS-S as its focus. Efforts have been made to integrate aspects of other science standards, particularly the earth and space science standards into this course to assure that students are provided an opportunity to form connections.

All NJSLS-S 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 [NJSLS-S](#) 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 NJLS-S aligned courses in the Fair Law Schools integrate the three dimensions discussed in the [Frameworks for Science Education](#) and the NJLS-S, 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; ([NJLS-S 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; ([NJLS-S 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. ([NJLS-S PDF](#))

Since coherence is a main dimension of the NJLS-S, consider reviewing the “story line” for the middle school [physical science](#), [life science](#), [earth and space science](#), and [engineering, technology and applications of science](#), as well as the high school [physical science](#), [life science](#), [earth and space science](#), and [engineering, technology and application of science](#) for a full picture of the NJLS-S philosophy. For a full picture of how these programs are implemented in the Fair Lawn Schools, visit the [district curriculum website](#).

As described in the NJLS-S, technical writing and reading non-fiction is also a focus of our 6-12 science curricula as required by the [NJSL-ELA Companion Standards](#). 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).

A particular focus will be made on the [cross cutting concepts](#) and the [science and engineering processes](#)

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"> Horticulture is the study of plants for beauty, comfort and food. Plants are all around us, and have both similar and varying characteristics Plants may be identified based on their characteristics Plants can be eaten 	<p><u>Essential Question(s)</u></p> <ol style="list-style-type: none"> 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"> Define horticulture. Describe the plant life cycle. Use and apply dichotomous keys for classification. Define and identify weeds. Define and identify deciduous trees. Describe the structure and function of plant structures. Apply the concepts of biodiversity, native and non-native species. 	<p><u>Assessments</u></p> <ol style="list-style-type: none"> report on one herbaceous plant fact sheet on planting bulbs and mums labs webquest presentation (honors only) work hours (including harvest festival)
<p><u>Suggested Activities</u></p> <ol style="list-style-type: none"> plant identification techniques create a dichotomous key webquest: value of horticulture colors of food – chromatography learn about watering, weeding, courtyard routines pumpkin dissection articles on current topics with comprehension questions report on one weedy plant develop fact sheet about planting bulbs and mums <p>Gardening Work</p> <ol style="list-style-type: none"> weeding harvesting plants 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

NJSLS-S: 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

<p><u>Enduring Understanding</u></p> <ol style="list-style-type: none"> 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 	<p><u>Essential Question(s)</u></p> <ol style="list-style-type: none"> 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>NJSLS-S:</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</p>	<p>Honors Differentiation</p> <ol style="list-style-type: none"> 1. 2 hours additional work 2. poster summarizing independent research

and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.]

[Assessment Boundary: Assessment does not include specific biochemical steps.]

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.]

[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.]

project (on one of plant processes)

3. 3- additional content on tests/quizzes

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 <p>Gardening Work</p> <ol style="list-style-type: none"> 7. houseplant propagation 8. plan gardens for spring 9. start seeds 10. grow plants for Mother's day (polka dot or herbs) <p>Current events/Issues</p> <ol style="list-style-type: none"> 11. organic/sustainable/ vs conventional gardening 12. GMO's <p>Field Trip</p> <ol style="list-style-type: none"> 13. Possible visit to an herb farm/greenhouse <p>Fundraiser</p> <ol style="list-style-type: none"> 14. sell polka dot plants for mothers day (or herb dish gardens) 	

NJSLS-S: 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"> 1. soil and seeds are essential to the success of plants 2. gardens need to be maintained with a variety of tasks 	<p><u>Essential Question(s)</u></p> <ol style="list-style-type: none"> 1. What are the most common insect, weed, and disease plant pests?
<p><u>Learning Objectives</u></p> <ol style="list-style-type: none"> 1. Apply the concept of planting for pollinators. 2. Analyze soil and apply the importance of soil. 3. Understand the roles of pests and insects. 	<p><u>Assessments</u></p> <ol style="list-style-type: none"> 1. informative sign for garden 2. labs 3. quizzes/test 4. powerpoint presentation (honors only) (effect of climate change on food production/horticulture) 5. work hours
<p><u>Suggested Activities</u></p> <ol style="list-style-type: none"> 1. soil testing 2. garden theme planning 3. repot house plants for (possible) sale <p>Gardening Work</p> <ol style="list-style-type: none"> 4. plant seeds outdoors 5. mulch beds 6. weed 7. maintain beds <p>Current events/Issues</p> <ol style="list-style-type: none"> 8. colony collapse disorder 9. 2- importance of soil health <p>Field Trip</p> <ol style="list-style-type: none"> 10. Hike to Weis Ecology Center <p>Fundraiser</p> <p>Sell seedlings/seed packs</p>	
<p><i><u>NJSLS-S HS-LS-2-8, ES-3-4</u></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</p>	<p>Honors Differentiation</p> <ol style="list-style-type: none"> 1. 2 hours additional work 2. additional content on tests/quizzes

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.]

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).]

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/NJSLS/science/http://www.njNJSLS.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.

Cross-Content Connections:

NJSLS Math: Click on the link to the High School Evidence Statements to see expectations related to mathematics for this unit.

NJSLS 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](#).

8.1: Use technology to collect and analyze data and to communicate findings with local peers and peers from other communities.

9.2: Explore careers directly related to this unit.

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.

NJSLS 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](#).

NJSLS 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.