Fair Lawn

Public Schools

Fair Lawn, NJ

Biology Academic, CP, Honors

August

2016

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Biology CP and Honors are a lab science class developed by the Fair Lawn High School Biology team and aligned to the NJSLS-S which are correlated to the NJSLS-M and NJSLS-LAL.

Science Department

Fair Lawn School District

Committee Credits

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Biology Academic, CP & Honors

I. Course Synopsis

The field of biology studies living things. Biologists investigate the interactions of living and non-living things within ecosystems, the relationships between cells and the maintenance of homeostasis in living things, and the genetic makeup and natural evolution of living things.
NJDOE Model Curriculum

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 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 NJSLS-S 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)

Since coherence is a main dimension of the NJSLS-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 NGSS 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 NJSLS-S, 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. In addition, our courses themselves are scaffold, in which academic courses provide targeted assistance in the subject area and particular assistance in the area of literacy and math while the expectations and depth of content in an honors course is greater.

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

The Biology CP program consists of six thematic units reflective of the NJDOE Model Curriculum. Each unit develops new content with consistent emphasis on the science and engineering processes, disciplinary core ideas, and cross cutting concepts reflective of the Next Generation Science Standards and the Frameworks for Science Education.

Marking Period 1

Unit 1: Matter & Energy in Organisms & Ecosystems (5 weeks):

1. How do organisms obtain and use energy they need to live and grow?
2. How do matter and energy move through ecosystems?

Unit 2: Interdependent Relationships in Ecosystems (3-4 Weeks):

1. How do the interactions between living and nonliving things affect the stability and biodiversity of the ecosystem?
2. How can new ecosystems arise from unstable ecosystems?

Marking Period 2

Unit 3: The Effect of Human Activity on Climate and Biodiversity (3-4 weeks):

1. How do humans depend on Earth's resources?
2. How does human activity impact Earth's climate?
3. How does human activity impact Earth's biodiversity?
4. How can these impacts be reversed?

Unit 4: Cell Specialization & Homeostasis (5 weeks):

1. How do the structures of organisms enable life's functions?
2. How does the structure of DNA relate to its function and to essential life functions?
3. How do various systems interact to enable life?
4. How do feedback mechanisms maintain homeostasis?

Marking Period 3

Unit 5: DNA & Inheritance (5 Weeks)

1. How are characteristics from one generation related to the previous generation?
2. How is diversity increased through genetic inheritance?

Marking Period 4 (Half Way Through Unit 6)

Unit 6: Natural Selection & Evolution (10 Weeks)

1. The Earth and the environmental changes control which populations of species survive and reproduce.
2. Evidence exists to support evolutionary relationships among organisms.

IV. Unit Descriptions

Unit 1: Matter & Energy In Organisms & Ecosystems (5 weeks - September-Early Oct):

Enduring Understanding:

1. Since matter and energy can not be created nor destroyed, organisms obtain their energy through trophic levels via cellular respiration or photosynthesis, to live and grow.
2. Matter changes forms via cellular respiration and photosynthesis within organisms and throughout the ecosystem.

Essential Questions:

1. How do organisms obtain and use energy they need to live and grow?
2. How do matter and energy move through ecosystems?

Unit Overview:

The driving focus of this unit will be that organisms transfer their energy and matter between themselves and the ecosystem in order to survive. Students will perform and develop investigations and review case studies which include the analysis of data to draw conclusions related to a unbalance within these cycles.

Learning Objectives:

Refer to the Evidence Statements for specific examples of depth of coverage beyond the scope of the curriculum.

1. Construct and revise, based on evidence, and explanation for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-3
    a. Explain that aerobic vs. anaerobic cellular respiration is based on the environmental factors. HS-LS2-3
    b. Compare and contrast the energy yields of anaerobic and aerobic cellular respiration. HS-LS2-3
    c. Construct an explanation of how energy of photosynthesis and respiration drive cycling of matter and flow of energy under both conditions. HS-LS2-3
2. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-5
    a. Diagram, review chemical equations, and understand conceptual models of the inputs and outputs of photosynthesis (not the biochemical steps). HS-LS1-5
3. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules. HS-LS1-6
    a. Explain the connections between carbon ingested and the formation of larger molecules based on evidence. HS-LS1-6
    b. Conduct investigations to gather evidence to support these conclusions. HS-LS1-6
4. 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. HS-LS1-7
    a. Describe the relationships between the reactants and products. HS-LS1-7
    b. Form connections between food molecules and the concept that energy is neither created nor destroyed but transferred. HS-LS1-7

5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS2-5
    a. Identify the inputs and outputs of photosynthesis and cellular respiration and the relationships between organisms and the environment within the carbon cycle. HS-LS2-5
6. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-4
    a. Demonstrate the conservation of matter and energy between trophic levels as energy and matter are transferred upward between organisms and their environment. HS-LS2-4

Limitations of this Unit (Not Covered nor Assessed):

1. Atomic structure
2. The bio chemical details of photosynthesis and cellular respiration.

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

1. Students with special needs and ELL learners may be provided with key vocabulary terms prior to the unit beginning.
2. ELL students may be provided with additional visual aids. For additional modifications, refer to Classroom Instruction that Works for ELL Learners *or the* SIOP protocol.
3. Gifted students may be challenged by asking them to form additional connections between biology, chemistry, and physics.
4. Students in honors biology may be introduced to the biochemical steps of photosynthesis and cellular respiration.

Cross-Content Connections:

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

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.

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.

Unit 2: Interdependent Relationships in Ecosystems (3-4 Weeks - Early Oct-Early November):

Enduring Understanding:

1. Many interactions between living and nonliving things affect the stability and biodiversity of the ecosystem.

Essential Questions:

1. *How do the interactions between living and nonliving things affect the stability and biodiversity of the ecosystem?*
3. *How can new ecosystems arise from unstable ecosystems?*

Unit Overview:

Students will examine a true case study, such as the wolves in Yellowstone National park, to explore how interactions between living and nonliving factors affected the ecosystem. Students in honors biology will then be given a choice of another case study to research and explain using mathematical or computational representations.

Learning Objectives:

Refer to the Evidence Statements for specific examples of depth of coverage beyond the scope of the curriculum.

1. Use math or computational representations to explain the density dependent and independent limitations on population growth. HS-LS2-1
    a. Use math or computational representations to explain the concept of carrying capacity. HS-LS2-1
    b. Analyze various density dependent and independent factors to determine which specifically has a greater effect on a given situation. HS-LS2-1
2. Use mathematical representations to support and revise explanations based on evidence about factors affecting the biodiversity and populations in ecosystems of different scales such as plants vs. animals vs. microbes and how interactions between them provide resources at both the microscopic and macroscopic level. HS-LS2-2
3. Evaluate claims, evidence, and reasoning that complex interactions in stable ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in new ecosystems. HS-LS2-6.

Limitations of this Unit (Not Covered nor Assessed):

1. Comparison of characteristics of biomes
2. Basic species interactions such as parasitism

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

1. Students with special needs and ELL learners may be provided with key vocabulary terms prior to the unit beginning.
2. ELL students may be provided with additional visual aids. For additional modifications, refer to Classroom Instruction that Works for ELL Learners *or the* SIOP protocol.
3. Students in honors biology may be asked to complete independent case study analysis.

Cross-Content Connections:

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

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.

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.

Unit 3: The Effect of Human Activity on Climate and Biodiversity (3-4 weeks - Early November - Early December):

Enduring Understanding:

1. Humans activity can impact the climate and Earth's biodiversity in many ways.
2. Various factors affected human distribution on earth.

Essential Questions:

1. How do humans depend on Earth's resources?
2. How does human activity impact Earth's climate?
3. How does human activity impact Earth's biodiversity
4. How can these impacts be reversed?

Unit Overview:

First, students will research a problem which is caused by human activity and then pose a solution to this problem. Students in honors biology will then create a simulation to test a solution while students in CP biology will revise simulations to test solutions, both via laboratory activities in class.

Learning Objectives:

Refer to the Evidence Statements for specific examples of depth of coverage beyond the scope of the curriculum.

1. Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-7
    a. Students research a solution to a problem such as overpopulation, overexploitation, habitat destruction, pollution, invasive species, climate change, or others. HS-LS2-7.
    b. Students will identify the effects of the problem, describe and quantify the criteria and constraints for the solution, along with trade offs to the solution. HS-LS2-7.
    c. Students will evaluate the proposed solution for its impact on overall environmental stability and changes, cost, safety, reliability, social, cultural, and environmental impacts. HS-LS2-7
    d. Honors Biology: Students refine the solution by prioritizing the criteria and making trade offs as needed.
2. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-LS4-6
    a. Honors Biology: Students create a simulation, under the guidance of the teacher, which models the effects of human activity, such as adverse habitat alterations, overpopulation, overexploitation, pollution, invasive species, changes in climate, on a threatened or endangered species or to the genetic variation within a species and provides quantitative information about the effect of the solution on the species.
    b. CP Biology: Students revise the simulation which is conducted in class as laboratory activities.

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

1. Students with special needs and ELL learners may be provided with key vocabulary terms prior to the unit beginning.
2. ELL students may be provided with additional visual aids. For additional modifications, refer to Classroom Instruction that Works for ELL Learners *or the* SIOP protocol.
3. Gifted students may be challenged by asking them to form additional connections between biology, chemistry, and physics.
4. Students in Honors Biology may be required to analyze additional effects and propose solutions to those problems.

Cross-Content Connections:

1. Construct an explanation based on evidence for how the availability of natural resources, such as freshwater and fossil fuels, and changes in climate are influenced by human activity. HS-ESS3-1
2. Create a computational simulation to illustrate the relationships among management of natural resources, sustainability of human populations to biodiversity. HS-ESS3-3
3. Evaluate or refine a technological solution that reduces impact of human activities on natural systems. HS-ESS3-
4. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. (HS-ETS1-1)
5. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.(HS-ETS1-2)
6. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. (HS-ETS1-3)
7. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. (HS-ETS1-4)

CCCS Math: Click on the link to the High School Evidence Statements to see expectations related to mathematics for this unit. Number Quantity, Algebra, Function, Modeling.

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.

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.

Unit 4: Cell Specialization & Homeostasis (5 weeks - Early December- Mid January):

Enduring Understanding:

1. The structures of and within living things are directly related to their functions.
2. Homeostasis is a delicate balance needed to maintain life.

Essential Questions:

1. How do the structures of organisms enable life's functions?
2. How does the structure of DNA relate to its function and to essential life functions?
3. How do various systems interact to enable life?
4. How do feedback mechanisms maintain homeostasis?

Unit Overview:

First, students will explore a disease which represents a lack of homeostasis, specifically, cystic fibrosis, in an effort to understand the relationship between the structure of DNA and specific cell functions. Second, students will compare and contrast the parent and daughter cells following the cell cycle to explain how specialized cells are produced and how DNA controls the functions of those cells. Connections will be made to cancer as a mistake in the cell cycle and the role of stem cells will be studied. Finally, students will study the connection between various animal systems and design an experiment to study the role of feedback mechanisms to control homeostasis.

Learning Objectives:

Refer to the Evidence Statements for specific examples of depth of coverage beyond the scope of the curriculum.

1. Explain, based on evidence on how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS-LS1-1
    a. Explain that DNA is composed of genes which code for proteins which carry out specialized functions. HS-LS1-1.
    b. Discuss the process of transcription and translation as they relate to the structure and function of the DNA and protein. Students should not memorize the steps of transcription or translation, or the biochemistry of DNA, RNA, or protein. HS-LS1-1
    c. Relate the primary, secondary and tertiary structure of a protein to its function. HS-LS1-1
    d. Honors Biology: Relate the role of the "R" groups in the structure and function of a protein. HS-LS1-1
    e. Describe the parts of the cell cycle and understand that mitosis is one part of the cell cycle. Explain how mistakes in the cell cycle may lead to cancer. HS-LS1
2. Use a model to illustrate the role of cellular division and differentiation in producing and maintaining complex organisms. HS-LS1-4
    a. Compare and contrast parent and daughter cells with relationship to the number of and similarity between chromosomes. HS-LS1-4
    b. Explain that all cells in an organism have the same DNA but only certain genes are active, leading to cell specialization. HS-LS1-4
    c. Relate the definition of stem cells to their role in development. HS-LS1-4

3. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-2
    a. Explain the role of the digestive system in delivering sugar to the rest of the body through the circulatory system. HS-LS1-2
    b. Observe and explain the process of diffusion and the effects at the microscopic level, using the compound light microscope. HS-LS1-2
    c. Compare the structures and relate the functions of various specialized cells, such as stomata, nerve cells, and gametes, at the microscopic level, using the compound light microscope. HS-LS1-2
    d. Analyze the etiology and effects of Celiac Disease which alters the homeostasis. HS-LS1-2
    e. Honors Biology: Analyze and explain the etiology and effects of diabetes and the connections between the circulatory system, digestive system, and endocrine system which are affected by diabetes. HS-LS-1-2
4. Plan and conduct an investigation to provide evidence those feedback mechanisms maintain homeostasis.
    a. Explain the role of the respiratory system in delivering oxygen and exporting carbon dioxide from the muscular system through the circulatory system and how exercise can affect homeostasis in humans or other factors may affect heart rate in daphnia. HS-LS1-3
    b. Explain the feedback mechanisms which control water loss in plants through stomata as results of changing variables such as light or heat and/or root development in plants by changing variables such as light or pH. HS-LS1-3

Limitations of this Unit (Not Covered nor Assessed):

1. The names and functions of all the organelles
2. The names and functions of the body parts
3. The stages of mitosis
4. The biochemistry of translation or transcription

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

1. Students with special needs and ELL learners may be provided with key vocabulary terms prior to the unit beginning.
2. ELL students may be provided with additional visual aids. For additional modifications, refer to Classroom Instruction that Works for ELL Learners *or the* SIOP protocol.
3. Gifted students may be challenged by asking them to form additional connections between biology, chemistry, and physics.

Cross-Content Connections:

CCCS Math: Click on the link to the High School Evidence Statements to see expectations related to mathematics for this unit. Number Quantity, Algebra, Function, Modeling.

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.

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.

Unit 5: DNA & Inheritance
(5 Weeks - February - Mid March)

Enduring Understanding:

1. DNA maintains proper cell division and development in health organisms.

Essential Questions:

2. *How are characteristics from one generation related to the previous generation?*
3. *How is diversity increased through genetic inheritance?*

Unit Overview:

Students will follow real-life examples of traits which are inherited from DNA to protein. A few days will be spent on modes of inheritance such as codominance, but the purpose will be for them to understand how specific traits are inherited. Finally, students will use evidence from experiments to demonstrate real-life examples of how variations are produced through genetic inheritance.

Learning Objectives:

Refer to the Evidence Statements for specific examples of depth of coverage beyond the scope of the curriculum.
Please refer to the curriculum document, in particular, the "evidence statements" when you develop these learning objectives!

**Any objective with a (*) will only be addressed in honors biology.*

1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS3-1
    a. Describe the cause and effect relationship between DNA, proteins, and the resulting traits. HS-LS3-1
    b. Describe how DNA expression is regulated through introns, extrons, etc. HS-LS3-1
    c. Explain how traits, such as blood type, colorblindness, cystic fibrosis, skin color are inherited through dominance, codominance, sex-linkage, and multiple alleles, to stress that DNA codes for traits. HS-LS3-1
2. Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic recombinations through meiosis, variable errors occurring during replication, and mutations caused by the environment. HS-LS3-2
    a. Provide evidence of how Down Syndrome or other such disorders may result from errors in meiosis. HS-LS3-2

Limitations of this Unit (Not Covered nor Assessed):

1. The stages of of meiosis
2. The biochemistry of transcription and translation.
3. The details of modes of inheritance

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

1. Students with special needs and ELL learners may be provided with key vocabulary terms prior to the unit beginning.
2. ELL students may be provided with additional visual aids. For additional modifications, refer to Classroom Instruction that Works for ELL Learners *or the* SIOP protocol.
3. Gifted students may be challenged by asking them to form additional connections between biology, chemistry, and physics.

Cross-Content Connections:

CCCS Math: Click on the link to the High School Evidence Statements to see expectations related to mathematics for this unit. Number Quantity, Algebra, Function, Modeling.

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.

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.

Unit 6: Natural Selection & Evolution (10 Weeks - Mid March - Early June)

****Please continue teaching this content even after the Biology State Test is Complete.*
You are not expected to complete this unit prior to the test!

Marking Period 3 Ends Half Way Through Unit 6

Enduring Understanding:

1. The Earth and the environmental changes control which populations of species survive and reproduce.
2. Evidence exists to support evolutionary relationships among organisms.

Essential Questions:

1. How can there be so many similarities among organisms yet so many different plants, animals, and microorganisms?

Unit Overview:

Students will review and analyze specific real-life case studies of examples of natural selection and speciation. They will perform and develop inquiry-based investigations which involved data analysis to draw conclusions on how and why speciation occurs.

Learning Objectives:

1. Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-LS4-5
    a. Analyze evidence such as data indicating change over time of number of individuals in a species, number of species in an environment, and the environment to determine the ability of a species to survive and reproduce. HS-LS4-5
2. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-4
    a. Construct an explanation which identifies a cause and effect relationship related to environmental changes and the survival rates of organisms and the fact that the organisms with the traits best suited for the environment will survive and reproduce. HS-LS4-4
    b. Reason that biotic and abiotic differences contribute to changes in gene frequency over time through natural selection. HS-LS4-4
3. Construct an explanation based on evidence that the process of evolution primarily results from (1) potential for species to increase in number; (2) heritable genetic variation of individuals in a species due to mutation and sexual reproduction; (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce. HS-LS4-2
    a. Give evidence of how these factors lead to higher rates of reproduction and survival. HS-LS4-2
    b. Analyze examples of new populations which are created through this process. HS-LS4-2

4. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS3-3
    a. Use the Hardy Weinberg Equilibrium Theory to explain and predict. HS-LS3-3
    b. Honors students will use the equilibrium theory to perform calculations.
    c. Analyze graphs of distributions of gene frequencies. HS-LS3-3
5. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence such as DNA sequences, anatomical structures, and appearance of structures in embryological development. HS-LS4-1
    a. Communicate using 2 forms of data such as written and mathematical. HS-LS4-1
6. Apply concepts of statistics and probability to support explanations that organisms with advantageous heritable traits tend to increase in proportion to organisms lacking this trait. HS-LS4-3
7. Evaluate the evidence for the role of group behavior on individual and species changes to survive and reproduce. HS-LS2-8.

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

1. Students with special needs and ELL learners may be provided with key vocabulary terms prior to the unit beginning.
2. ELL students may be provided with additional visual aids. For additional modifications, refer to Classroom Instruction that Works for ELL Learners *or the* SIOP protocol.
3. Students in honors biology may be required to analyze the data from hardy Weinberg calculations.

Cross-Content Connections:

1. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. HS ESS 2-7
2. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. HS-ESS-1-5
3. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. HS-ESS-1-6

CCCS Math: Click on the link to the High School Evidence Statements to see expectations related to mathematics for this unit. Number Quantity, Algebra, Function, Modeling.

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.

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.

V. Course Materials

Since textbooks are not currently available which are aligned to the NJSLS-S the following books will be used to supplement this curriculum. Students are not required to learn or understand everything in each chapter. The students are required to understand the objectives in the curriculum.

CP BIOLOGY: Glencoe Biology ZEBRA	HONORS: PH Biology Miller Levine DRAGON FLY	ACADEMIC: AGS Biology Cycles of Life
Chapter 2-2: Flow of Energy in an Ecosystem Chapter 2-3: Cycling of Matter Chapter 8*: Cellular Energy	Chapter 3: The Biosphere Chapter 8*: Photosynthesis Chapter 9*: Cellular Respiration	Chapter 1: Biology: Investigating the Cycles of Life Chapter 7*: Cellular Respiration Chapter 8*: Photosynthesis in Energy Cells
Chapter 2-1: Organisms & Their Relationships Chapter 4: Population Ecology	Chapter 5: Populations	Chapter 17: Populations & Communities
Chapter 5: Biodiversity & Conservation	Chapter 6: Humans in the Biosphere	Chapter 19: Human Impact & Technology
Chapter 7-4*: Cellular Transport Chapter 9*: Cellular Reproduction Chapter 12: Molecular Genetics *limited* Unit 9: Reference Unit	Chapter 7-3*: Cell Boundaries (Diffusion) Chapter 10*: Cell Growth & Division Chapter 12: DNA & RNA *limited* Unit 10: Reference Unit	Chapter 4*: Cells: The Basic Units of Life Chapter 5*: A Journey into the Eukaryotic Cell Chapter 9*: The Life Cycles of Cells & Reproduction Chapter 11: Genetic Information Cycles Chapter 12: Human Body Systems (Reference)
Chapter 10: Sexual Reproduction & Genetics Chapter 11: Complex Inheritance & Human Heredity	Chapter 11: Introduction to Genetics	Chapter 10: Inheritance Patterns in Life Cycles
Chapter 14: The History of LIfe Chapter 15: Evolution Chapter 16: Primate Evolution (Reference) Chapter 17: Organizing Life's Diversity (Reference)	Chapter 15: Darwin's Theory of Evolution Chapter 16: Evolution of Populations Chapter 17: The History of Life Chapter 18: Classification (Reference)	Chapter 13: Evolution & Natural Selection Chapter 14: Speciation & Punctuated Equilibrium Chapter 15: Phylogenies & Classifying Diversity (Reference)

VI. Assessments

Classroom assessments are included to primarily guide instruction (formative assessment) and to support decisions made beyond the classroom (summative assessment).

Sample assessments and classroom activities aligned to the NGSS can be found on the NGSS website.

Assessments in this course measure students' performance of scientific and engineering practices in the context of crosscutting concepts and disciplinary core ideas. These may include quizzes, tests, lab reports, lab questions, experimental design projects, engineering design projects, project-based assessments and other assessments with multiple components. (NRC, 2014)

NJDOE Science Related Assessment Resources

All Fair Lawn High School grading procedures will be followed.

VII. 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.