West Windsor-Plainsboro Regional School District
Course Title: Biology
Grades: 9-12

The Mission of the West Windsor-Plainsboro Science Department

Our mission is to cultivate science learners who have the foundational knowledge to make ethical, scientifically literate decisions and the ability to apply scientific practices in order to contribute to the needs of society and a changing world.

- **Vision**

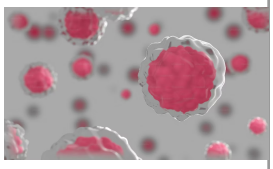
  We envision a K-12 science experience that supports and challenges every student in their science learning journey. We will:
  - *Capitalize on diversity by reaching and exciting students at all levels and interests by differentiating learning within classrooms and by offering a robust program of studies.*
  - *Emphasize authentic science and engineering practices and leverage the interdisciplinary nature of science with arts, technology, math, reading, and writing.*
  - *Integrate scientific knowledge and 21st century competencies to prepare students to make informed decisions and take action to address real world problems.*
  - *Cultivate an inclusive and diverse community where all learners are welcomed, valued, respected, and celebrated.*

Biology Multi-level Storyboard

Multi-level Biology students will explore what living things need to survive - from the cellular to the community level.

Essential Questions:

- How can scientific knowledge be used to address real world problems?
- What is the relationship between structure and function in biological systems?
- How do organisms interact with their environment and adapt to changes?

Science as a Process: *How do we find answers to our questions?*	**Interdependent Relationships in Ecosystems:** *How do living things depend on each other?*	**Matter and Energy in Organisms and Ecosystems:** *How do we get the energy we need to live?*	**Cells:** *How do our cells work together to keep us alive?*	**Inheritance and Variation of Traits:** *How do we get our traits?*	**Natural Selection and Evolution:** *How did we evolve to become what we are today?*
					
The Focus of the Story	**The Focus of the Story**	**The Focus of the Story**	**The Focus of the Story**	**The Focus of the Story**	**The Focus of the Story**
"How is science actually conducted?" We will learn about the scientific process as we work as scientists ourselves. We will observe phenomena, generate questions, conduct studies to investigate these questions, and explain and share our findings.	Scientists constantly observe how living things interact with each other and their environment. Why do living things need to interact to survive? We will explore the various living and nonliving interactions that occur within ecosystems and their importance for species survival.	Energy is essential to fueling living things. How do organisms harness, use, and store energy? We will compare different organisms and understand how they convert and use energy to maintain life on Earth.	We know that living things obtain energy. What do they use that energy to do? We will learn about how systems work together within a cell and within multi - cellular organisms to keep us alive.	While living things share many similarities, they have differences too! What causes this variation? We will learn about how genetic information impacts our traits and how that information is passed down through generations.	If genetic information is passed down through generations, how does that explain the new species that have arisen over time? We will learn about how evolution has shaped the history of life and how all species are related through their common ancestors!

Learning Targets	Learning Targets	Learning Targets	Learning Targets	Learning Targets	Learning Targets
I can generate questions about a specific topic or phenomenon. I can gather information on data and scientific theories and develop a hypothesis. I can analyze, interpret and communicate my findings through developing a claim and supporting it with reasoning and evidence.	I can explain how all living things are interconnected in an ecosystem. I can explain key ecological principles and the role of biodiversity in ecosystem stability. I can determine ways human activity has caused changes to an ecosystem that can shift populations and species distribution.	I can explain the interconnectedness of photosynthesis and cellular respiration. I can analyze environmental impacts of photosynthesis and cellular respiration. I can describe how energy is transferred through an ecosystem.	I can describe the structure and function of specialized structures within cells. I can explain the relationship between a protein's structure and function. I can analyze and explain how cells maintain homeostasis through various transport mechanisms.	I can explore the structure and function of DNA. I can investigate genetic variation and how it contributes to diversity in species. I can understand the impact of genetic factors on human health. I can explore how to use genetic technologies in an ethical manner.	I can apply evolution principles to real world scenarios. I can explore the evidence supporting the theory of evolution. I can analyze the impact of environmental factors on the process of evolution.

Unit 1: Science as a Process

Content Area: Science

Course & Grade Level: Biology 9-12

Summary and Rationale

Students formulate an answer to the question: “How is science actually conducted?”. Students are able to use and understand the process of science as a tool to plan and conduct investigations, analyze data, and communicate. Students will explore climate change data, use a variety of available lab equipment in order to generate their own data, and demonstrate their understanding through critical reading and models. The crosscutting concept of systems and system modes is called out as organizing concepts. They can relate the tentative nature of science to explain how our understandings and implications may change in light of new evidence.

Recommended Pacing

3-4 weeks

New Jersey Student Learning Standards for Science

CPI #	Cumulative Progress Indicator (CPI)
HS-ETS1-2	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-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change). [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]
HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

New Jersey Student Learning Standards for English Language Arts Companion Standards

CPI #	Cumulative Progress Indicator (CPI)
NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart)
RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.5.DA.1:	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.5:	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
8.2.5.ED.2:	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards (Math and Social Studies)	
Math S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
Math S-MD.A	Calculate expected values and use them to solve problems.
6.1 US History	All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
6.2 US History	All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- The process of science helps biologists investigate how nature works on multiple levels, from individual molecules to the entire biosphere.
- Scientists observe phenomena and develop questions that can lead to predictions, studies, and possible explanations.
- Scientific knowledge is built on both expected and unexpected outcomes.
- Science is a growing body of knowledge that is always open to correction and revision.
- Using multiple representations to analyze data allows scientists to model, understand, and predict scientific phenomena.
- Through experimentation, scientists have identified several characteristics that are shared between all living things.

Unit Essential Questions

- What areas of science are included within the subject of Biology?
- How is knowledge built and shared within the scientific community?
- How are trust and credibility built within the scientific and global communities?
- What principles guide the global scientific process?
- What distinguishes reliable scientific evidence from pseudoscience?
- How does scientific thinking help us define what we consider to be alive?

Objectives

We are learning to/that in Unit 1…

SWBAT…

- Apply the scientific process for problem solving.
- Develop questions based on observations in order to drive scientific investigation.
- Design and carry out a controlled experiment to understand the process of science.
- Collect and represent data through a variety of modalities.
- Use mathematics and computational thinking to support scientific conclusions.
- Analyze and interpret data and communicate information using a variety of modalities.
- Evaluate the quality of evidence.
- Engage in argument from evidence to explain natural phenomena.
- Construct explanations and design solutions for complex real world environmental problems.
- Obtain, evaluate and communicate information to develop technological literacy and an understanding of the role of information technologies in modern scientific endeavors.
- Discuss the importance of proper lab technique and safety precautions.
- Use laboratory equipment to obtain qualitative and quantitative data.
- Investigate the central themes of biology and the characteristics of living things.

Evidence of Learning

☑ **Formative Assessment**

A few examples of daily formative assessments would be: teacher check ins, exit tickets, observations of student groups, student conferences, etc.

☑ **Summative Assessment**

Students will be assessed in the following ways, and will be differentiated accordingly:

- CERs
- Tests and Quizzes
- Labs (Lab Analysis/Experimental Design)
- Projects
- Case Studies

☑ **Alternative Assessment**

Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…

- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark**

Humboldt Squid Lab Common Assessment: Students are presented with the problem of overpopulation by an invasive species. They will design and conduct an experiment testing how to most effectively reduce the invasive species population.

- Students will be able to design and conduct a controlled experiment in order to solve a real world biological phenomena.
- Students will be able to effectively analyze and draw conclusions from their data set.
- Students will be able to make strong predictions based on trends in the data.
- Students will be able to evaluate the effectiveness of their experimental design and reflect upon it.

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Texts:
Biology, Miller and Levine
Biology: Concepts and Connections, Campbell

Resources for Teachers:
Biology Pacing Guide
Biology: ML Unit Plan
Overarching Phenomena
Other Phenomena

Common Assessment:
Experimental Design Rubric

Unit 2: Interdependent Relationships in Ecosystems

Content Area: Science

Course & Grade Level: Biology 9-12

Summary and Rationale

Students answer the question, “How do organisms interact with the living and nonliving environment?”. High school students demonstrate an ability to investigate the role of biodiversity in ecosystems and the role of animal behavior on survival of individuals and species. Students have increased understanding of interactions among organisms and how those interactions influence the population dynamics of ecosystems. Specifically, changes in population dynamics can result from human influence. Students can generate mathematical comparisons, conduct investigations, use models, and apply scientific reasoning to link evidence to explanations about interactions and changes within ecosystems.

Recommended Pacing

5-6 weeks

New Jersey Student Learning Standards for Science

CPI #	Cumulative Progress Indicator (CPI)
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]
HS-LS2-8	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.]
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other 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).]

New Jersey Student Learning Standards for English Language Arts Companion Standards

CPI #	Cumulative Progress Indicator (CPI)
RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

RST.9-10.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
NJSLSA.W7	Conduct short as well as more sustained research projects, utilizing an inquiry based research process, based on focused questions, demonstrating understanding of the subject under investigation.
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others
9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.2.DA.4:	Make predictions based on data using charts or graphs.
8.1.12.DA.5:	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
8.2.12.ETW.3 :	Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
Interdisciplinary Standards (Math and Social Studies)	
Math S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
Math S-MD.A	Calculate expected values and use them to solve problems.
6.1 US History	All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
6.2 US History	All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- The existence of life on Earth depends on interactions among organisms and between organisms and their environment.
- All living things are interconnected in an ecosystem.
- The stability of an ecosystem relies upon the interactions of abiotic and biotic factors.
- Ecosystem stability is limited to a narrow range of tolerance and tiny shifts in abiotic or biotic factors can have an amplified effect on the ecosystem.
- Biodiversity is critical for ecosystem resilience.
- Changes caused by human activity to ecosystems can shift populations and species distribution, sometimes past the point of return.

Unit Essential Questions

- How can change in one part of an ecosystem affect change in other parts of the ecosystem?
- How do varied relationships among species influence biodiversity within an ecosystem?
- How do behavioral adaptations, such as herd behavior, affect the survival of a species?
- How have human activities and climate change shaped local and global ecology?
- How will we know when Earth has reached its carrying capacity?
- What are some possible solutions to address changes in ecosystems due to human interference?

Objectives

We are learning to/that in Unit 2…

SWBAT…

- Evaluate the importance of biodiversity in maintaining healthy ecosystems.
- Identify and describe the components within ecosystems and the functions of different ecosystems.
- Analyze the impacts of changes in abiotic conditions and biotic interactions on ecosystems.
- Define the roles of producers, consumers, and decomposers in an ecosystem.
- Investigate food webs and the transfer of energy within ecosystems.
- Analyze the factors that affect population size, growth, and distribution.
- Assess the consequences of overpopulation, including competition for resources, disease, and loss of biodiversity.
- Explain different types of ecological relationships that exist within ecosystems.
- Describe the importance of predation and competition in maintaining a balance in ecosystems.
- Understand the ways in which human activities can negatively impact ecosystems and their interdependent relationships.
- Develop critical thinking and problem-solving skills by identifying and proposing solutions to environmental issues in different ecosystems.
- Understand the role of conservation and ecosystem management in protecting the natural world.

Evidence of Learning

☑ **Formative Assessment**

A few examples of daily formative assessments would be: teacher check ins, exit tickets, observations of student groups, student conferences, etc.

☑ **Summative Assessment**

Students will be assessed in the following ways, and will be differentiated accordingly:

- CERs
- Tests and Quizzes
- Labs (Lab Analysis/Experimental Design)
- Projects
- Case Studies

☑ **Alternative Assessment**

Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…

- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark**

Climate Change Project Common Assessment: Students will research how climate change has impacted the life cycle, habitat, resources, etc. of an organism.

- Students will be able to make predictions about how a change to one species impacts ecological relationships within an ecosystem.
- Students will be able to illustrate trends and fluctuations in populations over time.
- Students will be able to propose and evaluate solutions to reduce the human impact on the environment.

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Texts:

Biology, Miller and Levine
Biology: Concepts and Connections, Campbell

Resources for Teachers:
Biology Pacing Guide
Biology: ML Unit Plan
Overarching Phenomena
Other Phenomena

Common Assessment:
Climate Change Common Assessment

Unit 3: Matter and Energy in Organisms and Ecosystems

Content Area: Science

Course & Grade Level: Biology 9-12

Summary and Rationale

Students answer the questions: “How do organisms obtain and use energy they need to live and grow? How do matter and energy move through ecosystems?”. High school students can construct explanations for the role of energy in the cycling of matter in organisms and ecosystems. They can apply mathematical concepts to develop evidence to support explanations of the interactions of photosynthesis and cellular respiration and develop models to communicate these explanations. Students understand the interaction of organisms with each other and their physical environment. Students will also understand how organisms obtain resources and how changes in the environment affect ecosystems. In addition, students can utilize the crosscutting concepts of matter and energy and systems and system models to make sense of ecosystem dynamics.

Recommended Pacing

4-5 weeks

New Jersey Student Learning Standards for Science

CPI #	Cumulative Progress Indicator (CPI)
HS-LS1-5	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.]
HS-LS1-6	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. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]
HS-LS1-7	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.]
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]
HS-LS2-4	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.]
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [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.]
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change). [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
NJSLSA.W7	Conduct short as well as more sustained research projects, utilizing an inquiry based research process, based on focused questions, demonstrating understanding of the subject under investigation.
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart)
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately
9.4.2.CT.2:	Identify possible approaches and resources to execute a plan
9.4.2.IML.2:	Represent data in a visual format to tell a story about the data
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.5.DA.5:	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
8.1.5.DA.1:	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.4:	Organize and present climate change data visually to highlight relationships or support a claim.
Interdisciplinary Standards (Math and Social Studies)	
Math S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
Math S-MD.A	Calculate expected values and use them to solve problems.
6.1 US History	All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
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Instructional Focus

Unit Enduring Understandings

- Biomass generally decreases as one moves up trophic levels because energy is not effectively transferred between trophic levels.
- In light of the many damaging qualities of radiant energy, most of life on earth cannot exist without it.
- Matter cycles and energy flows: this delicate balance is maintained in ecosystems and ultimately the biosphere.
- The structure of plants and animals is directly related to acquiring and using energy.
- The human driven output of carbon dioxide has disrupted the balance of the carbon cycle.

Unit Essential Questions

- How do organisms obtain, store and use the energy they need to survive?
- How does energy from the sun get converted to chemical energy living organisms can use to perform life functions?
- Where does the mass of photosynthetic organisms come from?
- How is organic matter recycled within organisms and ecosystems?
- Why do plants need to do cellular respiration if they perform photosynthesis?
- How do the structures of living things allow them to acquire and use matter and energy?
- How have increased greenhouse gas emissions affected our climate and the resilience of ecosystems?

Objectives

We are learning to/that in Unit 3…

SWBAT…

- Describe the flow of energy and matter through ecosystems.
- Explore the concept of ecological efficiency and its role in limiting the amount of energy available for each successive trophic level.
- Analyze the processes of photosynthesis and cellular respiration as crucial metabolic pathways of living organisms.
- Investigate the specialized structures of living things that facilitate photosynthesis and cellular respiration.
- Explore the relationship between photosynthesis, cellular respiration, and global carbon cycling.
- Explain the relationship between photosynthesis and cellular respiration in the production and consumption of carbohydrates.
- Analyze the roles of carbohydrates in providing energy and as essential building blocks for living organisms.
- Explore the role of ATP in the storage and transfer of energy at the cellular level.
- Identify the different factors affecting the rate of photosynthesis and cellular respiration, including light intensity, temperature, and the availability of nutrients.
- Evaluate the impact of human activities, such as deforestation and climate change, on the rates of photosynthesis and cellular respiration, and their effects on ecosystems.

Evidence of Learning

☑ **Formative Assessment**

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☑ **Summative Assessment**

Students will be assessed in the following ways, and will be differentiated accordingly:

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☑ **Alternative Assessment**

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- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark**

Ecosphere Common Assessment: Students will construct explanations and make predictions about organisms in a self-sustaining ecosystem called an Ecosphere. Students will design and create their own Ecosphere based on principles of Ecology.

- Students will be able to explain how the ecosystem is dependent on energy from photosynthetic organisms.
- Students will be able to describe how chemical processes such as decomposition allow matter to cycle through an ecosystem.
- Students will be able to make predictions about how a change to one part of an ecosystem affects the interdependent relationships throughout the ecosystem.
- Student will be able to predict how ecological relationships are being modified due to human activity

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Texts:
Biology, Miller and Levine
Biology: Concepts and Connections, Campbell

Resources for Teachers:
Biology Pacing Guide
Biology: ML Unit Plan
Overarching Phenomena
Other Phenomena

Common Assessment:
Ecosphere Common Assessment

Unit 4: Cells

Content Area: Science

Course & Grade Level: Biology 9-12

Summary and Rationale

Students formulate an answer to the question: “How do the structures of organisms enable life’s functions?”. Students are able to investigate explanations for the structure and function of cells as the basic units of life, the hierarchical systems of organisms, and the role of specialized cells for maintenance and growth. Students demonstrate understanding of how systems of cells function together to support the life processes. Students demonstrate their understanding through critical reading, using models, and conducting investigations. The crosscutting concepts of structure and function, matter and energy, and systems and system models in organisms are called out as organizing concepts.

Recommended Pacing

9-10 weeks

New Jersey Student Learning Standards for Science

CPI #	Cumulative Progress Indicator (CPI)
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]
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.]
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]
HS-LS1-4	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.]

New Jersey Student Learning Standards for English Language Arts Companion Standards

CPI #	Cumulative Progress Indicator (CPI)
RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
NJSLSA.W7	Conduct short as well as more sustained research projects, utilizing an inquiry based research process, based on focused questions, demonstrating understanding of the subject under investigation.

New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills

CPI #	Cumulative Progress Indicator (CPI)
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
9.4.2.IML.2:	Represent data in a visual format to tell a story about the data
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving

New Jersey Student Learning Standards for Computer Science and Design Thinking

CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.5:	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
8.1.12.DA.6:	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.2.5.ED.2:	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards (Math and Social Studies)	
Math S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
Math S-MD.A	Calculate expected values and use them to solve problems.
6.1 US History	All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
6.2 US History	All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- A cell is the most basic unit of life; the processes that occur at the cellular level provide the energy and primary structure living things need to survive.
- Chemical reactions occur in a cell, to rearrange the molecules of life in order to create specific structures for different functions.
- A vast variety of proteins carry out the essential functions of life in specialized cells.
- Through passive and active transport mechanisms, the cell maintains a balanced equilibrium.
- Through the cell cycle, cells divide, specialize, and go through apoptosis.

Unit Essential Questions

- How do cell structures enable a cell to carry out basic life processes?
- How does a cell maintain homeostasis both within itself and as a part of a multicellular organism?
- How do cells know when, how, and to what extent perform their functions?
- How do cells work together within a multicellular organism to maintain homeostasis?
- How does one cell give rise to two identical cells in order to allow for growth and development of an organism?
- What happens when the process of cell division goes wrong?

Objectives

We are learning to/that in Unit 4…

SWBAT…

- Explain the relationship between a protein's structure and function.
- Explain why enzymes are essential to organisms.
- Investigate disorders related to protein malfunction or deficiencies.
- Describe the limitations of cell size as it relates to its function.
- Describe the structure and function of specialized structures within cells.
- Describe the structure and function of prokaryotic and eukaryotic cells and their importance in the ecosystem.
- Compare and contrast the structure and functions of different types of cells.
- Describe the process of differentiation.
- Describe the structure of the cell membrane and the mechanisms whereby substances enter and leave cells.
- Explain how cells maintain homeostasis through various transport mechanisms (active and passive transport)
- Design and conduct laboratory experiments to observe and measure different types of cell transport

- Analyze and explain how unicellular and multicellular organisms maintain homeostasis.
- Describe the impact of atmospheric pollutants on human health.
- Compare asexual and sexual reproduction.
- Construct explanations on the role of chromosomes in mitosis.
- Explain and model how the cell cycle is controlled.
- Compare and contrast how cancer cells differ from normal cells and understand the underlying causes of uncontrolled cell growth.

Evidence of Learning

☑ **Formative Assessment**
A few examples of daily formative assessments would be: teacher check ins, exit tickets, observations of student groups, student conferences, etc.

☑ **Summative Assessment**
Students will be assessed in the following ways, and will be differentiated accordingly:
- CERs
- Tests and Quizzes
- Labs (Lab Analysis/Experimental Design)
- Projects
- Case Studies

☑ **Alternative Assessment**
Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…
- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark**
Cell Specialization Project Common Assessment: Students will create a project summarizing the unique structures of differentiated cells and how they allow for specialized functions within the body.
- Students will be able to make connections between structure and function in specialized cells.
- Students will be able to compare and contrast varying types of differentiated cells.
- Students will be able to explain how differentiated cells work together in order to maintain homeostasis in multicellular organisms.

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Texts:
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Biology: Concepts and Connections, Campbell
Resources for Teachers:
Biology Pacing Guide
Biology: ML Unit Plan
Overarching Phenomena
Other Phenomena

Common Assessment:
Humanville

Unit 5: Inheritance and Variation of Traits

Content Area: Science

Course & Grade Level: Biology 9-12

Summary and Rationale

Students formulate answers to the questions: "How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?". The LS3 Disciplinary Core Idea includes two sub- ideas: Inheritance of Traits and Variation of Traits. Students are able to ask questions, make and defend a claim, and use concepts of probability and an understanding of the events in meiosis to explain the genetic variation in a population. Students demonstrate understanding of why individuals of the same species vary in how they look, function, and behave. Students can explain the mechanisms of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expression. Crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these core ideas.

Recommended Pacing

9-10 weeks

New Jersey Student Learning Standards for Science

CPI #	Cumulative Progress Indicator (CPI)
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

New Jersey Student Learning Standards for English Language Arts Companion Standards

CPI #	Cumulative Progress Indicator (CPI)
RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart)
RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills

CPI #	Cumulative Progress Indicator (CPI)
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities

New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.5.DA.5:	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
8.1.2.DA.3:	Identify and describe patterns in data visualizations.
8.1.12.DA.6:	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
Interdisciplinary Standards (Math and Social Studies)	
Math S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
Math S-MD.A	Calculate expected values and use them to solve problems.
6.1 US History	All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
6.2 US History	All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

Instructional Focus

Unit Enduring Understandings

- DNA, the universal code of life, determines an organism's characteristics.
- Environmental factors can influence the expression of traits in organisms.
- The reproductive process leads to genetic variation in a number of ways.
- Genetic inheritance usually follows predictable patterns, resulting in a variety of traits in offspring.
- Probability can be used to predict the possible outcomes of traits in offspring.
- Genetic diversity is critical to the resilience of populations.
- Modern genetic techniques can be applied to many societal issues.

Unit Essential Questions

- How does the structure of DNA influence the production of proteins and the expression of traits?
- Why are individuals not identical to their parents?
- How does genetic information pass from one generation to another?
- Why are identical twins not exactly the same?
- How can probability be used to predict the outcomes of a genetic cross?
- How can one deduce the pattern of inheritance of a trait based on data?
- How can biotechnology be used to address modern problems?
- What constitutes an ethical use of biotechnology?

Objectives

We are learning to/that in Unit 5…

SWBAT…

- Model how the structure of an organism's DNA codes for a specific protein, which carries out specific functions in the organism.
- Describe how patterns of gene expression determine the function of a cell.
- Compare and contrast the impacts of different types of genetic mutations.
- Model the process of meiosis, by which cells halve their genetic material in order to maintain chromosome numbers in sexual reproduction.
- Compare and contrast mitosis and meiosis.
- Explain how variation is introduced in meiosis through the process of crossing over and through the independent assortment of chromosomes.
- Use probability analysis and Punnett Square to predict the likelihood of an individual inheriting a trait.
- Differentiate between Mendelian and non-Mendeliean patterns of inheritance.

- Analyze and interpret data from pedigrees and genetic crosses in order to determine the pattern of inheritance of a trait.
- Describe the relationship between genes and the environment.
- Explain the importance of maintaining genetic diversity for the health of a population.

Evidence of Learning

☑ **Formative Assessment**
A few examples of daily formative assessments would be: teacher check ins, exit tickets, observations of student groups, student conferences, etc.

☑ **Summative Assessment**
Students will be assessed in the following ways, and will be differentiated accordingly:
- CERs
- Tests and Quizzes
- Labs (Lab Analysis/Experimental Design)
- Projects
- Case Studies

☑ **Alternative Assessment**
Assessments will be differentiated in various ways based on the needs of the students. Differentiation could be in…
- Content (texts, phenomena, graphs, data tables, vocabulary, etc.)
- Process (scaffolding, guiding questions, small group instruction, etc.)
- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark**
Genetic Disorder Project Common Assessment: Students will select a genetic disorder/mutation and conduct research in order to illustrate how a change in DNA leads to an altered protein, which manifests itself into physiological symptoms.
- Students will be able to examine how DNA mutations lead to changes in protein shape or expression.
- Students will be able to explain how the structure of proteins determine their function, and changes to proteins can disrupt bodily processes.
- Students will be able to make predictions about the inheritance of this genetic disorder within the family.

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

Resources

Core Texts:
Biology, Miller and Levine
Biology: Concepts and Connections, Campbell
Resources for Teachers:
Biology Pacing Guide
Biology: ML Unit Plan
Overarching Phenomena
Other Phenomena

Common Assessment:
Genetic Disorder Project (Rubric)

Unit 6: Natural Selection and Evolution

Content Area: Science

Course & Grade Level: Biology 9-12

Summary and Rationale

Natural Selection and Evolution helps students formulate an answer to the question, "What evidence shows that different species are related?". The LS4 Disciplinary Core Idea involves four sub-ideas: Evidence of Common Ancestry and Diversity, Natural Selection, Adaptation, and Biodiversity. Students can construct explanations for the processes of natural selection and evolution and communicate how multiple lines of evidence support these explanations. Students can evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in populations as those trends relate to advantageous heritable traits in a specific environment. The crosscutting concepts of cause and effect and systems and system models play an important role in students' understanding of the evolution of life on Earth.

Recommended Pacing

6-7 weeks

New Jersey Student Learning Standards for Science

CPI #	Cumulative Progress Indicator (CPI)
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the 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 in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on the number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]
HS-LS4-5	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. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

HS-ESS3-4	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).]
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources
9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others
New Jersey Student Learning Standards for Computer Science and Design Thinking	
CPI #	**Cumulative Progress Indicator (CPI)**
8.1.2.DA.1:	Collect and present data, including climate change data, in various visual formats.
8.1.12.DA.5:	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
8.2.12.ETW.3 :	Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
Interdisciplinary Standards (Math and Social Studies)	
Math S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
Math S-MD.A	Calculate expected values and use them to solve problems.
6.1 US History	All students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.
6.2 US History	All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.
Instructional Focus	
Unit Enduring Understandings	
• Natural selection, along with other mechanisms, is a driving force of evolution. • Variation among individuals in a population are the result of multiple mechanisms and lead to the evolution of favorable adaptations. • Biodiversity is the result of ongoing evolutionary change and greater biodiversity promotes ecosystem resilience. • All species alive today have evolved from one common ancestor of the past. • Closely related species share anatomical, developmental, and biochemical similarities. • Barriers to reproduction lead to speciation.	

- Extinction occurs when species don't have the adaptations necessary for survival, which is happening at record rates due to human activity.

Unit Essential Questions

- How does natural selection lead to adaptation of populations?
- What are the main lines of scientific evidence that support Darwin's theory of evolution?
- How is human evolution shifting? How have selective pressures changed with technological advances?
- What ties all current life on Earth to single-celled organisms that evolved billions of years ago?
- How can populations form new species?
- Why do some organisms go extinct and others survive? What happens to an ecosystem when a species goes extinct?
- Why is evolution the unifying principle of life?

Objectives

We are learning to/that in Unit 6…
SWBAT…

- Engage in argument from evidence to explain how evolution occurs through natural selection.
- Describe the conditions necessary for natural selection to occur.
- Analyze and interpret data to explain how various lines of evidence support evolutionary theory.
- Compare and contrast Darwin and Lamarck's Theory of evolution and explain why Darwin's theories are still accepted today.
- Predict how human driven changes to the environment will impact the course of evolution.
- Compare and contrast acclimatization and adaptation as responses to environmental change.
- Develop and use models, such as phylogenetic trees, to analyze the evolution of organisms based on anatomical traits/DNA/amino acid sequences.
- Describe how reproductive barriers can lead to populations facing different selective pressures, which can ultimately lead to populations diverging enough to become different species.
- Explain how present day species are related to common ancestors of the past.
- Construct an explanation to show that while natural selection explains evolutionary modifications within lineages, speciation explains evolutionary branching and diversification.

Evidence of Learning

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A few examples of daily formative assessments would be: teacher check ins, exit tickets, observations of student groups, student conferences, etc.

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- CERs
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- Product (individual components, student choice in modality such as video, skit, etc)

☑ **Benchmark**
Endless Forms Project Common Assessment: Students will research an organism with a unique or unusual adaptation that enables it to survive in its environment and show their understanding through constructing a narrative illustrating its evolution.

- Students will be able to demonstrate their understanding of natural selection by making predictions of how this species evolved from its ancestors.
- Students will be able to describe the conditions that allow new species to form from closely related species.
- Students will be able to examine how environmental factors determine the fitness of an organism

Assessment Statement for Science Curriculum

The assessment plan includes teacher-designed formative and summative assessments, including common assessments, self-assessments, and performance tasks aligned with the NJSLS-S and the NJSLS-S for Climate Change. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative assessments are individualized for the needs of all students. Accommodations

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Other Phenomena

Common Assessment:
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