West Windsor-Plainsboro Regional School District
Course Title: Science
Grade: 7

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**

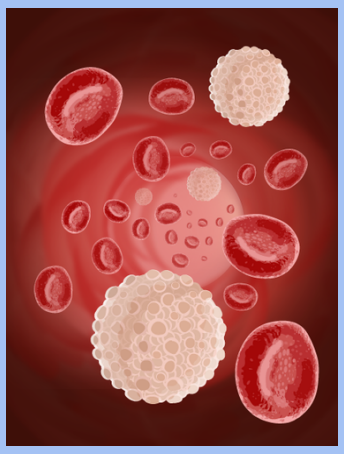
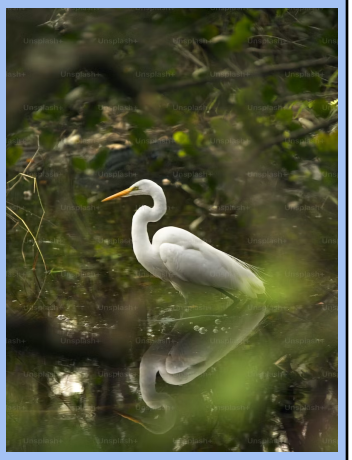
  We envision a K-12 science experience that supports and challenges every student in their science learning journey. We will:
  - *Capitalize on diversity by reaching and exciting students at all levels and interests by differentiating learning within classrooms and by offering a robust program of studies.*
  - *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.*

7th Grade Science Storyboard

7th graders will explore how energy is gathered, transferred, processed, and exchanged among organisms and the physical world around them.

Essential Questions:

- Where does the energy in the world come from and how is it transformed into forms utilized by humans?
- How are cells, tissues, organs, and organ systems both interrelated, yet independent functional units?
- How is structure related to function in living and nonliving things?
- In what way can our actions or inactions either protect or harm the health and biodiversity of the ecosystem?

Unit 1: **Exploring Energy, Forces and Motion in Action!**	**Unit 2:** **The Wonder of the Human Body: Cells & Systems**	**Unit 3:** **Unlocking the Secrets of Life's Diversity: Genetics, Adaptation, and Evolution**	**Unit 4:** **Unraveling the Web of Life: Ecosystems**
			
THE FOCUS OF THE STORY	**THE FOCUS OF THE STORY**	**THE FOCUS OF THE STORY**	**THE FOCUS OF THE STORY**
Energy is used to create forces and make things spring into action like amusement park rides, motor vehicles, sports games and more!. As scientists, we'll conduct exciting investigations to see how matter and objects behave when energy is added, taken away, or transformed. We'll see objects soar, gears spin, and more! We'll conduct exciting investigations to see how matter and objects behave when energy is added, taken	Cells are amazing, and they team up to create our awesome human body! We'll learn all about cells, tissues, organs, and organ systems, and how they work together like a well-oiled machine. Did you know that every living thing is made up of tiny cells? We'll explore how these cells are like the building blocks of life, and how they give rise to bigger and more complex systems. We'll also discover the incredible connection between a cell's structure and	From tiny cells to the vast diversity of life on Earth, we will unravel the mysteries of genetics and discover how these processes shape the world around us. We'll learn how genetics, adaptation, and evolution explain how living organisms inherit traits, adapt to their environments, and evolve over time. We'll begin to understand why DNA is so important, and its vital role in passing on traits from parents to offspring, and how our genes shape who we are.	We have the power to impact the health and biodiversity of the ecosystems right here in New Jersey! Together, we'll explore different factors that can affect our ecosystems, both natural and human-made. We will learn how we have an important role to play in preserving and protecting ecosystems, and our actions or inactions can either help or cause harm.

away, or transformed. It's like being a detective, searching for clues to solve the mystery of how energy affects the world around us.	its job. You see, each cell has a specific function, like a superhero with a unique power. We'll investigate how the shape, parts, and special features of a cell help it do its important work. It's like a puzzle where all the pieces fit perfectly!		
LEARNING TARGETS	**LEARNING TARGETS**	**LEARNING TARGETS**	**LEARNING TARGETS**
I can calculate the gravitational potential energy of an object at a given height and mass. I can use force diagrams to describe the magnitude and direction of parallel and perpendicular forces acting upon an object and the direction of motion of the object. I can collect, interpret, and utilize data to explain the role of humans in an ecosystem.	I can explain the concepts of cells, tissues, organs, and organ systems in regards to how they are interrelated, yet independent functional units. I can develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. I can write an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	I can explain why offspring share some, but not all traits of their parents. I can collect, interpret, and utilize data to explain how humans impact the diversity and stability of ecosystems and how we can minimize our negative impact. I can explain how natural selection drive change within populations of organisms over time	I can explain how humans impact the diversity and stability of ecosystems I can collect, interpret, and utilize data to understand how invasive species can alter an ecosystem. I can be more environmentally conscious and minimize my negative impact on ecosystems.

Unit 1: Energy, Forces, and Motion	
Content Area: Science	
Course & Grade Level: 7th Grade Science	
Summary and Rationale	
In this unit, students will begin exploring the concepts of energy and energy transfer between objects, as well as the use of energy to drive forces and motion of objects and organisms. Students will conduct investigations to show the behavior of matter and systems of objects as energy is added, removed, and transformed within the system, and explore the resulting forces and motions of objects. Students will focus upon the cross-cutting concepts of energy and matter, cause and effect, and systems and system models as they learn the concepts of potential and kinetic energy and balanced and unbalanced forces. Students will plan and carry out their own investigations involving gravity, electricity, and Newton's Laws, and use mathematics and computational thinking to form evidence-based arguments describing the motion of objects and the impacts of energy transfer.	
Recommended Pacing	
9 weeks (45 days)	
New Jersey Student Learning Standards for	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-PS2-1	**Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*** *[Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]*
MS-PS2-2	**Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** *[Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]*
MS-PS2-3	**Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.** *[Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]*
MS-PS2-5	**Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.** *[Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]*
MS-PS3-1	**Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.** *[Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]*
MS-PS3-2	**Develop a model to describe that when the arrangement of objects interacting at a distance**

	changes, different amounts of potential energy are stored in the system. *[Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]*
MS-PS3-5	**Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.** *[Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]*
MS-ESS3-5	**Ask questions to clarify evidence of the factors that have caused climate change over the past century.** *[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]*
MS-ESS3-1	**Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** *[Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]*
MS-ESS3-3	**Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** *[Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]*
MS-ESS3-4	**Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** *[Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]*
MS-LS2-1	**Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** *[Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]*

New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. *(MS-PS3-1),(MS-PS3-5)*
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)
WHST.6-8.1	Write arguments focused on discipline content. *(MS-PS3-5)*
WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-PS3-2)*
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
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.
8.1.2.DA.3	Identify and describe patterns in data visualizations.
8.1.2.DA.4	Make predictions based on data using charts or graphs.
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.
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 (Social Studies and Math)	
Mathematics	
MP.2	Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-5)
6.RP.A.1	Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5)

6.RP.A.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1)
7.RP.A.2	Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5)
8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)
8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. (MS-PS3-1)
8.F.A.3	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MS-PS3-5)
Social Studies	
6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
6.3 Active Citizenship in the 21st Century:	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

- Newton's three basic Laws of Motion govern the relationship between forces and motion. Energy takes many forms (Nuclear, electromagnetic, thermal, mechanical, and chemical).
- These forms of energy can be grouped into types of energy that are associated with the motion of mass (kinetic energy), and types of energy associated with the position of mass (potential energy).
- When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. (Changes take place because of the transfer of energy).
- Change and transfer of energy results in forces.
- Many devices transform one form of energy into another. Examples are batteries which convert chemical energy into electrical energy, motors which convert electrical energy into mechanical energy, and bulbs which convert electrical energy into heat and light.
- An object's position can be described by locating the object relative to other objects or a background.
- The description of an object's motion from one observer's view may be different from that reported from a different observer's view.
- Magnetic, electrical, and gravitational forces can act at a distance. Magnetic and electrical forces can also generate energy fields between objects that are not in direct contact proportional to the distance between the objects.
- An object is in motion when its position is changing. The speed of an object is defined by how far it travels divided by the amount of time it took to travel that far.
- Organisms and their environments are interconnected. Changes in energy in one part of the system will affect other parts of the system.
- Humans utilize finite resources on Earth that can negatively impact ecosystems which utilize those same resources.
- Environmental factors can influence the traits and growth of populations of organisms and individuals based upon limited resource availability.

Unit Essential Questions

- How do we know that objects and systems have energy?

- How can Newton's Laws of Motion predict what will happen to an object when acted upon by balanced and unbalanced forces?
- Where does the energy in the world come from and how is it transformed into forms utilized by humans?
- How can energy be transferred between objects within a system?
- How can something appear to be standing still when it is really moving forward?
- What is the relationship between distance and magnitude of a force (magnetic, electrical and gravitational)?
- How can change in energy and limited resources in one part of an ecosystem affect change in other parts of the ecosystem?
- How does the transformation of the finite energy sources on Earth driven by increasing population and subsequent human needs impact the climate?

Ability Objectives

General for all Units:

- Develop and carry out scientific investigations.
- Obtain, evaluate and communicate information to develop technological literacy and an understanding of the role of information technologies in modern scientific endeavors.
- Develop and use models to explain complex processes and relationships between and within organisms.
- Analyze and interpret data and communicate information using a variety of modalities.
- Use mathematics and computational thinking to support scientific conclusions.
- Engage in argument from evidence to explain natural phenomena.
- Construct explanations and design solutions for complex real world environmental problems.

Learning Objectives Specific for Unit 1

Students will be able to:

- Calculate the gravitational potential energy of an object at a given height and mass using the mgh equation. **(MS-PS3-1, MS-PS3-2, MS-PS3-5)**
- Develop a model showing the average change in energy of an object as it changes positions. **(MS-PS2-2)**
- Use a model to predict the motion of two objects of similar and different masses after a collision. **(MS-PS2-1, MS-PS2-2)**
- Use force diagrams to describe the magnitude and direction of parallel and perpendicular forces acting upon an object and the direction of motion of the object. **(MS-PS2-2)**
- Create a model of electromagnetic fields (using iron filings, etc.) **(MS-PS2-3, MS-PS2-5)**
- Gather and evaluate information in order to create a compelling argument using evidence about the harm caused to the stability of a New Jersey ecosystem. **(MS-ESS3-3)**
- Collect, interpret, and utilize empirical data to demonstrate understanding of the role of humans in an ecosystem. **(MS-ESS3-3, MS-ESS3-4)**

Evidence of Learning

☑ **Formative Assessment**

- Teacher check ins
- Exit tickets
- Observations of student groups
- Student conferences

☑ Summative Assessment

Students will be assessed in the following ways:

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

☑ **Alternative Assessment**
- Podcasts
- Videos
- Graphic Design
- Constructing Models
- Assessments will be differentiated and responsive to student's individual needs as appropriate*

☑ Benchmark - Common Assessment

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 Text:
Reference Textbooks: Buckley, Don. *Interactive Science*. Pearson, 2011.
Prentice Hall Science Explorer: *Physical Science*
Prentice Hall Science Explorer: Motion, Forces, and Energy
STCMS, *Energy, Forces, and Motion*

Suggested Resources:
Lesson Ideas- http://www.ck12.org/ngss/middle-school-physical-sciences/matter-and-its-interactions
Concept Help- http://www.bozemanscience.com
Wonder of Science- https://thewonderofscience.com/graphics
Energy Lab- http://www.pbs.org/wgbh/nova/labs/about-energy-lab/educator-guide/
R.E.A.C.T- http://www.nrel.gov/docs/gen/fy01/30927.pdf
NGSS- http://ngss.nsta.org/AccessStandardsByTopic.aspx
Force Diagram Explanation
Energy Usage in New Jersey Resources: NJ Electricity Profile, D&R Canal Dredging, NOAA Damage Assessment, Etc

Unit 2: Cells & Human Body Systems	
Content Area: Science	
Course & Grade Level: 7th Grade Science	
Summary and Rationale	
In this unit, students will begin exploring the concepts of cells, tissues, organs, and organ systems in regards to how they are interrelated, yet independent functional units. Students will be able to understand that all organisms are made of cells, and those cells give rise to more complex systems. Students will gather information to support explanations of the relationship between structure and function within cells and between the cell and its surrounding environment. The crosscutting concepts of energy and matter, structure and function, and systems and system models provide a framework for understanding the relationship between cells, body systems, and the energy transfers between them. Students will focus upon constructing physical and conceptual models of animal cells and human body systems, plan and carry out investigations showing the relationships between body systems, and analyze and interpret data from their constructed experiments to form evidence-based arguments for the importance of the digestive, respiratory, and circulatory systems.	
Recommended Pacing	
10 weeks (55 days)	
New Jersey Student Learning Standards for	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-LS1-1	**Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** *[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and nonliving cells, and understanding that living things may be made of one cell or many and varied cells.]*
MS-LS1-2	**Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** *[Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]*
MS-LS1-3	**Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** *[Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]*
MS-LS1-7	**Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** *[Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]*
MS-ESS3-5	**Ask questions to clarify evidence of the factors that have caused climate change over the past century.** *[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in*

	incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]
MS-LS2-4	**Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** *[Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]*
New Jersey Student Learning Standards for English Language Arts Companion Standards	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. *(MS-PS3-1),(MS-PS3-5)*
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)
WHST.6-8.1	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3)
WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-PS3-2)*
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
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.
8.1.2.DA.3	Identify and describe patterns in data visualizations.
8.1.2.DA.4	Make predictions based on data using charts or graphs.
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.
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 (Social Studies and Math)		
Mathematics		
6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2)	
Social Studies		
6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.	
6.3 Active Citizenship in the 21st Century	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

- All organisms take in materials from their environment to be rearranged in support of fueling their internal systems, and expel waste back into the environment to maintain efficiency.
- Both matter and energy are necessary to build and maintain structures within the organism.
- Organelles and organs are structured for specific functions.
- Tissues, organs and organ systems are composed of cells specialized for particular body functions.
- Human body systems function to rearrange matter into forms useful for survival.
- Human body systems function both independently and interconnectedly to support the essential processes of life.
- Climate change affects plants and animals that humans rely on for life.
- Disability and malfunction of the human body systems drives innovation in engineering and development of prosthetics. The ultimate goal of these innovations is to provide equitable life experiences to persons born with disabilities impacting their physical and mental health.

Unit Essential Questions

- How do organelles function independently and together to support the life processes of the animal cell?
- Why is the mechanical and chemical transformation of food necessary within the human body, both in the digestive system and in interconnected systems?
- How are systems of the human body interrelated and how do they depend upon each other?
- What is the relationship between the structure of a cell, tissue, organ, organ system and their respective functions?
- In what ways do the needs of the human body system impact food-related industries, and how do those industries subsequently impact the planet?

Ability Objectives

General for all Units:

- Develop and carry out scientific investigations.

- Obtain, evaluate and communicate information to develop technological literacy and an understanding of the role of information technologies in modern scientific endeavors.
- Develop and use models to explain complex processes and relationships between and within organisms.
- Analyze and interpret data and communicate information using a variety of modalities.
- Use mathematics and computational thinking to support scientific conclusions.

Learning Objectives Specific for Unit 2

Specific for this unit:

- Differentiate between single and multicellular organisms. **(MS-LS1-1, MS-LS1-2)**
- Demonstrate the processes of diffusion, osmosis, and active transport, as well as the features of the membrane that allow these processes to occur. **(MS-LS1-2)**
- Form an explanation supported by a model for the changes to the structure of food as it passes through primary organs by detailing how the structure of each primary organ influences the transformation of food. **(MS-LS1-3, MS-LS1-7)**
- Explain how the digestive, respiratory, and circulatory systems are interconnected and how each impacts the breakdown of the matter of food to release energy by constructing a model of cellular respiration. **(MS-LS1-3)**
- Demonstrate and justify explanations of how blood flows through the heart as a result of the structure of the chambers, valves, and vessels of the organ. **(MS-LS1-2, MS-LS1-3)**
- Describe how the changing global climate can result in the proliferation of viruses that can impact human sustainability and populations. **(MS-LS2-4) (MS-ESS3-5)**
- Design a model to show the impact of multiple organisms competing for a resource on the stability of the human population. **(MS-LS2-4)**
- Humans need various nutrients to sustain their bodily systems- nutrients obtained from livestock are provided by industries that increase their carbon emissions in a way directly related to the growing human population. **(MS-LS3-1) (MS-ESS3-5)**

Evidence of Learning

☑ **Formative Assessment**
- Teacher check ins
- Exit tickets
- Observations of student groups
- Student conferences

☑ **Summative Assessment**

Students will be assessed in the following ways:
- CERs
- Tests and Quizzes
- Labs (Lab Analysis/Experimental Design)
- Projects
- Case Studies

☑ **Alternative Assessment**
- Podcasts
- Videos
- Graphic Design
- Constructing Models
- Assessments will be differentiated and responsive to student's individual needs as appropriate*

☑ **Benchmark** Common Assessment tbd

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 Text: Buckley, Don. *Interactive Science*. Pearson, 2011 **STCMS, *Human Body Systems*** **Lesson Ideas-** **http://www.discoveryeducation.com/teachers/free-lesson-plans/the-ultimate-guide-human-body.cfm** **Concept Help- http://www.bozemanscience.com** **Wonder of Science- https://thewonderofscience.com/graphics** **Virtual Look Into the Human Body** **NGSS- http://ngss.nsta.org/AccessStandardsByTopic.aspx** **Climate Change Resources for Performance Tasks: Climate change & Vector borne diseases CDC, Climate change & Allergens CDC, Climate Change & Covid BBC**

Unit 3: Genetics/Adaptation/Evolution	
Content Area: Science	
Course & Grade Level: 7th Grade Science	
Summary and Rationale	
In this unit, students will begin exploring the concepts of DNA and patterns of inheritance. Students will be able to understand the importance of DNA, chromosomal count and uniformity, the inheritance and patterns of dominance in alleles, the effect of genes on protein synthesis leading to unique traits, and the copying of genetic material to create identical cells. Students will investigate how changing patterns in DNA and alleles can cause variation and mutation, and predict how the genes of two parents can lead to observable patterns in offspring. Students will develop mathematical models using Punnett Squares, and analyze and interpret data in the form of pedigrees and karyotypes.	
Recommended Pacing	
8 weeks (40 days)	
New Jersey Student Learning Standards for	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-LS3-1	**Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.** *[Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]*
MS-LS3-2	**Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** *[Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]*
MS-LS4-1	**Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** *[Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]*
MS-LS4-2	**Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.** *[Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]*
MS-LS4-3	**Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.** *[Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]*
MS-LS4-4	**Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.** *[Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]*

MS-LS4-5	**Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.** *[Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]*
MS-LS4-6	**Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.** *[Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]*
MS-ESS3-5	**Ask questions to clarify evidence of the factors that have caused climate change over the past century.** *[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]*
MS-LS2-1	**Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** *[Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]*
MS-LS2-5	**Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*** *[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]*
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.4	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 6–8 texts and topics. (MS-LS3-1), (MS-LS3-2)
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1), (MS-LS3-2)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1), (MS-LS3-2)
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1), (MS-LS4-2), (MS-LS4-3), (MS-LS4-4), (MS-LS4-5)
RST. 6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3), (MS-LS4-4)
WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (MS-LS4-2), (MS-LS4-4)
WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),

	(MS-LS4-4)
SL .8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2), (MS-LS4-4)
SL.8.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2), (MS-LS4-4)
WHST.6-8.1	Write arguments focused on discipline content. (MS-ESS3-4)
WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a)
9.4.8.IML.2	Identify specific examples of distortion, exaggeration, or misrepresentation of information.
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.
8.1.2.DA.3	Identify and describe patterns in data visualizations.
8.1.2.DA.4	Make predictions based on data using charts or graphs.
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.
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 (Social Studies and Math)	
Mathematics	
MP.4	Model with mathematics. (MS-LS3-2)
6.SP.B.5	Summarize numerical data sets in relation to their context. (MS-LS3-2)

6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4), (MS-LS4-6)
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1), (MS-LS4-2)
P.A7.R.2	Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)
MP.2	Reason abstractly and quantitatively. (MS-ESS3-2), (MS-ESS3-5**)**
7.RP.A.2	Recognize and represent proportional relationships between quantities. (MS-ESS3-3), (MS-ESS3-4)
7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5)
Social Studies	
6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.
6.3 Active Citizenship in the 21st Century	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

- Genetic variation among offspring results from the independent assortment and segregation of alleles within parent genotypes.
- Genetic information within offspring is inherited in pairs of alleles; one from each parent organism.
- Genotype determines phenotype in organisms, though the reverse is not always true.
- Traits and behaviors are naturally selected over time to increase the fitness of a population of organisms.
- Genes control singular traits through genetic coding for sequences of proteins.
- Modification in the genome of an organism can result in desired traits.
- Allele expression follows a predictable pattern.
- Humans can alter the living and nonliving factors within an ecosystem, thereby creating changes to the overall system.
- Humans utilize finite resources on Earth that can negatively impact ecosystems which utilize those same resources.
- The presence of humans alters the ecosystems of Earth in more significant positive and negative ways as human populations increase over time.
- The complexity of traits among organisms fluctuates over long periods of time in accordance with adaptation to changing environments.
- Alterations to specific genes can result in heritable disabilities. These disabilities are typically present in all cells of the affected individual, and current genetic research focuses largely upon finding a way to treat these disabilities.

Unit Essential Questions

- Why do different organisms of the same species feature different traits?
- Why does sexual reproduction between parent organisms increase the potential survivability of a given population of offspring?
- How do internal genetic factors influence the observable traits of an organism?
- How does natural selection drive change within populations of organisms over time?

- Why do offspring share some, but not all traits of their parents?
- How can change in one part of an ecosystem affect change in other parts of the ecosystem?
- How do humans impact the diversity and stability of ecosystems?
- How can humans minimize their negative impacts upon the ecosystems of Earth?
- Why does the introduction of invasive species alter ecosystems?

Ability Objectives

General for all Units:

- Develop and carry out scientific investigations.
- Obtain, evaluate and communicate information to develop technological literacy and an understanding of the role of information technologies in modern scientific endeavors.
- Develop and use models to explain complex processes and relationships between and within organisms.
- Analyze and interpret data and communicate information using a variety of modalities.
- Use mathematics and computational thinking to support scientific conclusions.
- Engage in argument from evidence to explain natural phenomena.
- Construct explanations and design solutions for complex real world environmental problems.

Learning Objectives Specific for Unit 3

Students will be able to:

- Using Mathematics and computational thinking, students will solve Punnett Squares to predict the pattern of inheritance of given traits for offspring between two parents of known genotype. **(MS-LS3-2, MS-LS4-6)**
- Construct an explanation for how mutations such as inversion, deletion, etc. impact the production of proteins by using base-pair alterations as compared to normal protein production as evidence. **(MS-LS3-1, MS-LS3-2, MS-LS4-2)**
- Utilize a model to show the inheritance of genes through production of unique sperm and eggs. **(MS-LS4-3, MS-LS4-4)**
- Interpret data on crop yields and reduction of negative traits and diseases to form an argument for or against the proliferation of GMOs and potential human genetic engineering. **(MS-LS4-4, MS-LS4-5)**
- Identify and use evidence to explain the impact of physical and behavioral adaptations that contribute to a species' fitness. **(MS-LS4-1)**
- Gather and evaluate information in order to create a compelling argument using evidence about the harm caused to the stability of a New Jersey ecosystem. **(MS-LS2-5)**
- Collect, interpret, and utilize empirical data to demonstrate understanding of the role of humans in an ecosystem. **(MS-LS2-1, MS-LS2-5)**
- Create a model predicting how an ecosystem will change when a new species is introduced into an ecosystem. **(MS-LS2-1, MS-LS2-5)**
- Design a model to show the impact of multiple organisms competing for a resource on the stability of an ecosystem. **(MS-LS2-1, MS-LS2-5)**
- Plan and carry out an investigation to gather data on the structure of an ecosystem in New Jersey, and detail how the components of the ecosystem influence each other. **(MS-LS2-1, MS-LS2-5)**
- Analyze and interpret data on the biodiversity of a given ecosystem to evaluate the ecosystem's relative health. **(MS-LS2-5)**
- Obtain and communicate evidence about problems facing New Jersey ecosystems and their effects on the local wildlife populations. **(MS-LS2-1, MS-LS2-5)**
- Ask questions and define the parameters of a solution for one of the problems disrupting the stability of the ecosystem within a New Jersey State Park. **(MS-LS2-1, MS-LS2-1)**
- Analyze and interpret data to evaluate the positive and negative effects of selective breeding within the livestock industry on the global climate. **(MS-ESS3-5)**
- Describe areas of stability and change within an ecosystem in regards to varying plant life impacted by and impacting climate change. **(MS-ESS3-5)**

Evidence of Learning
☑ **Formative Assessment** ○ Teacher check ins ○ Exit tickets ○ Observations of student groups ○ Student conferences
☑ **Summative Assessment** Students will be assessed in the following ways: ○ CERs ○ Tests and Quizzes ○ Labs (Lab Analysis/Experimental Design) ○ Projects (such as Genetic Disorder Project) ○ Case Studies
☑ **Alternative Assessment** ○ Podcasts ○ Videos ○ Graphic Design ○ Constructing Models ○ Assessments will be differentiated and responsive to student's individual needs as appropriate*
☑ **Benchmark** Common Assessment
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
Reference Texts: *Organisms - From Macro to Micro* STCMS **Buckley, Don. *Interactive Science*. Pearson, 2011** **Prentice Hall Science Explorer: Physical Science 10** **Prentice Hall Science Explorer: Motion, Forces, and Energy 10** **Energy, Forces, and Motion, STCMS 10** **Human Body Systems STCMS 22** **LS1.A: Structure and Function 25** **Videos- https://www.youtube.com/watch?v=B_PQ8qYtUL0** **https://www.brainpop.com/health/geneticsgrowthanddevelopment/genetics/** **https://www.brainpop.com/health/geneticsgrowthanddevelopment/heredity/** **https://www.brainpop.com/health/geneticsgrowthanddevelopment/dna/** **NGSS- http://ngss.nsta.org/AccessStandardsByTopic.aspx** ● **Cystic Fibrosis (for Kids) - Nemours KidsHealth** ● **Cystic Fibrosis (for Parents) - Nemours KidsHealth** ● **About Autism - Genome.gov** ● **Medline**

Unit 4: Ecosystems	
Content Area: Science	
Course & Grade Level: 7th Grade	
Summary and Rationale	
In this unit, students will explore factors such as the introduction of invasive species, natural disasters, and human intervention that can impact the health and biodiversity of an ecosystem. Students will be able to understand the role that humans play in preserving ecosystems and how to best mitigate the damage that humans and invasive species do to varying ecosystems in New Jersey. Students will work to analyze the cause and effect relationship between the introduction of selected invasive species as well as the use of biodiversity to predict the relative stability of ecosystems. Students will plan and carry out investigations regarding invasive species at state parks, and analyze their collected data to aid in constructing rational solutions to improve the health of New Jersey ecosystems.	
Recommended Pacing	
8 weeks (45 days)	
New Jersey Student Learning Standards for	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
MS-LS2-1	**Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]
MS-LS2-4	**Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]
MS-LS2-5	**Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*** [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]
MS-LS4-1	**Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]
MS-ESS3-3	**Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
MS-ESS3-4	**Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of

	impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]
New Jersey Student Learning Standards for English Language Arts Companion Standards	
Standard:	
CPI #	**Cumulative Progress Indicator (CPI)**
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
WHST.6-8.1	Write arguments focused on discipline content.
WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills	
CPI #	**Cumulative Progress Indicator (CPI)**
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
9.1.8.FP.1	Describe the impact of personal values on various financial scenarios.
9.1.8.FP.2	Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.
9.1.8.FP.3	Explain how self-regulation is important to managing money (e.g., delayed gratification, impulse buying, peer pressure, etc.).
9.1.8.PB.1	Predict future expenses or opportunities that should be included in the budget planning process.
9.1.8.PB.3	Explain how to create a budget that aligns with financial goals.
9.1.8.PB.6	Construct a budget to save for short-term, long term, and charitable goals.
9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).

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.
8.1.2.DA.3	Identify and describe patterns in data visualizations.
8.1.2.DA.4	Make predictions based on data using charts or graphs.
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.
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 (Social Studies and Math)	
Mathematics	
MP.2	Reason abstractly and quantitatively
6.RP.A.1	Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities.
6.RP.A.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.
7.RP.A.2	Recognize and represent proportional relationships between quantities.
8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
Social Studies	
6.1 U.S. History	America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in 6.1 U.S. History of local, national, and global communities.
6.3 Active Citizenship in the 21st Century	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	
● Organisms and their environments are interconnected. Changes in one part of the system will affect other parts of the system. ● Humans can alter the living and nonliving factors within an ecosystem, thereby creating changes to the overall system. ● Humans utilize finite resources on Earth that can negatively impact ecosystems which utilize those same resources. ● The presence of humans alters the ecosystems of Earth in more significant positive and negative ways as human populations increase over time. ● The stability of an ecosystem depends upon the presence of connected living and non-living factors. ● Environmental factors can influence the traits and growth of populations of organisms and individuals based upon limited resource availability. ● The complexity of traits among organisms fluctuates over long periods of time in accordance with adaptation to changing environments.	
Unit Essential Questions	

- How can change in one part of an ecosystem affect change in other parts of the ecosystem?
- How do humans impact the diversity and stability of ecosystems?
- How can humans minimize their negative impacts upon the ecosystems of Earth?
- Why does the introduction of invasive species alter ecosystems?

Ability Objectives

General for all Units:

- Develop and carry out scientific investigations.
- Obtain, evaluate and communicate information to develop technological literacy and an understanding of the role of information technologies in modern scientific endeavors.
- Develop and use models to explain complex processes and relationships between and within organisms.
- Analyze and interpret data and communicate information using a variety of modalities.
- Use mathematics and computational thinking to support scientific conclusions.
- Engage in argument from evidence to explain natural phenomena.
- Construct explanations and design solutions for complex real world environmental problems.

Learning Objectives Specific for Unit 4

Students will be able to:

- Identify and use evidence to explain the impact of physical and behavioral adaptations that contribute to a species' fitness. **(MS-LS4-1)**
- Gather and evaluate information in order to create a compelling argument using evidence about the harm an invasive species can cause to the stability of a New Jersey ecosystem. **(MS-LS2-5, MS-ESS3-3)**
- Collect, interpret, and utilize empirical data to demonstrate understanding of the role of humans in spreading invasive species. **(MS-ESS3-3, MS-ESS3-4, MS-LS2-5, MS-LS4-1)**
- Create a model predicting how an ecosystem will change when a new species is introduced into an ecosystem. **(MS-LS2-5, MS-LS4-1)**
- Describe how the introduction of an invasive species (the lionfish) disrupts an established food web by analyzing and interpreting data about population sizes over time. **(MS-LS2-1, MS-LS2-4)**
- Design a model of a device to capture/eliminate a harmful invasive species to assist with controlling the impact of that species on a given previously stable ecosystem. **(MS-LS2-1, MS-LS2-4, MS-LS2-5)**
- Design a model to show the impact of multiple organisms competing for a resource on the stability of an ecosystem. **(MS-LS2-1, MS-LS2-4, MS-LS2-5)**
- Plan and carry out an investigation to gather data on the structure of an ecosystem in New Jersey, and detail how the components of the ecosystem influence each other. **(MS-LS2-1, MS-LS2-4, MS-LS2-5)**
- Analyze and interpret data on the biodiversity of a given ecosystem to evaluate the ecosystem's relative health. **(MS-LS2-5)**
- Obtain and communicate evidence about problems facing New Jersey ecosystems and their effects on the local wildlife populations. **(MS-LS2-1, MS-LS2-4, MS-LS2-5)**
- Ask questions and define the parameters of a solution for one of the problems disrupting the stability of the ecosystem within a New Jersey State Park. **(MS-LS2-1, MS-LS2-4, MS-LS2-5)**
- Collect and analyze samples of soil and flora from a New Jersey state park to interpret the effects of weathering and erosion upon the local ecosystem. **(MS-ESS2-2, MS-ESS2-3, MS-ESS3-1)**

Evidence of Learning

☑ **Formative Assessment**

- Teacher check ins
- Exit tickets
- Observations of student groups
- Student conferences

☑ **Summative Assessment**

Students will be assessed in the following ways:

- CERs

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

☑ **Alternative Assessment**

- Podcasts
- Videos
- Graphic Design
- Constructing Models
- Assessments will be differentiated and responsive to student's individual needs as appropriate*

☑ **Benchmark Common Assessment**

- Ecosystems Common Assessment

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 Text: None

Suggested Resources:

Resources with Videos-

http://www.ck12.org/ngss/middle-school-life-sciences/ecosystems:-interactions,-energy,-and-dynamics

TedEd - Why is biodiversity so important? https://www.youtube.com/watch?v=GK_vRtHJZu4

US Gov website on invasive species https://www.doi.gov/invasivespecies/

CNN Report on lionfish invasion

https://search.yahoo.com/yhs/search?p=lionfish+invasion+youtube&ei=UTF-8&hspart=mozilla&hsimp=yhs-004

http://news.nationalgeographic.com/2015/07/150723-lionfish-invasive-species-destructive-fish-cannibalism-florida/

http://oceanservice.noaa.gov/education/stories/lionfish/teachers.html#ideas

http://news.nationalgeographic.com/2015/07/150723-lionfish-invasive-species-destructive-fish-cannibalism-florida/

http://bioweb.uwlax.edu/bio203/s2008/ouvrard_mich/adaptation.html

Field Work- http://ei.cornell.edu/ecology/invspec/early/default.html

Diseases/ invasives- https://www.nwf.org/Wildlife/Threats-to-Wildlife/Disease.aspx

NGSS- http://ngss.nsta.org/AccessStandardsByTopic.aspx