Somers Point School District

Curriculum

Science

Grade 6

July 2016

Board Approved: September 2016

Table of Contents

Somers Point School District

Board of Education:

Board of Education
Mr. Richard Gray, President
Mr. Wes Kazmarck, Vice President
Mrs. Karen Broomall
Mr. John Conover
Mr. Todd Fath
Mrs. Staci Endicott
Mr. Michael O'Brien
Mr. Michael Sweeder
Mr. Nicholas Wagner

Interim Superintendent of Schools

Dr. Thomas Baruffi

Secretary to the Superintendent:

Mrs. Mary Ann Duffey

Business Administrator/Board Secretary:

Ms. Suzanne Keller

Acknowledgments

The following individuals are acknowledged for their assistance in the preparation of this Curriculum:

Writer's Name: Theodore Nick Thompson

Administrator: Kim Tucker, Supervisor of Curriculum

Secretarial Staff: Suzanne Klotz

Somers Point Schools

Mission and Beliefs

Mission

Empower each student to make responsible choices, meet challenges, achieve personal success, and to contribute to a global society as they apply the New Jersey Core Curriculum Standards to become autonomous, lifelong learners who are literate, problem solvers across all disciplines.

Beliefs

Beliefs: We believe that our empowered learners:

- Participate in educational programs that are designed to meet the needs of learners while providing challenging activities in the context of real life situations.
- Are aware of community issues and take part in activities to better their community.
- Acquire basic skills in obtaining information, thinking critically, solving problems and communicating effectively.
- Develop intellectual curiosity and the ability to access information as needed
- Become reflective learners that have an understanding of their own strengths and weaknesses.
- Develop the aptitudes and skills to adjust to a changing world and an unpredictable future.
- Are lifetime learners who value and accept learning as a continuing and dynamic process affecting all aspects of life.

PROGRAM PHILSOSOPHY, GOALS, AND BELIEFS

Philosophy

An effective science curriculum…

- Reflects the belief that all students can and must learn enough science to assume their role as concerned citizens equipped with necessary information and decision-making skills;
- Reflects a nature of knowledge, pedagogy, and nature of human development linked to empirical research;
- Recognizes that an inquiry-based method is used to study sound science content;
- Encourages teachers to view that the study of science should be interesting and relevant to students' lives, emphasize student understanding through inquiry and be connected with other school subjects especially math.

Unifying Concepts and Processes

An effective science curriculum incorporates the following while addressing the content areas…

1. Systems, order and organizations
2. Evidence, models and explanation
3. Changes, constancy and measurement
4. Evolution and equilibrium
5. Form and function
6. Abilities to do and understanding of scientific inquiry
7. Technology
8. Social perspective

Educational Goals & Beliefs

- Inquiry is an effective method to actively involve students.
- All students share a natural curiosity about the world around them.
- Curriculum provides real world connections.
- Effective instruction integrates concepts within science and other content areas.
- Assessment is ongoing, diagnostic, and aligned with instruction.
- Students can improve their community and the world through problem-solving.
- The broad goal of a science program should be to foster understanding, interest, and appreciation of the world in which we live.

New Jersey State Department of Education
Core Curriculum Content Standards

Science Education in the 21st Century

"Today more than ever before, science holds the key to our survival as a planet and our security and prosperity as a nation" (Obama, 2008).

Scientific literacy assumes an increasingly important role in the context of globalization. The rapid pace of technological advances, access to an unprecedented wealth of information, and the pervasive impact of science and technology on day-to-day living require a depth of understanding that can be enhanced through quality science education. In the 21st century, science education focuses on the practices of science that lead to a greater understanding of the growing body of scientific knowledge that is required of citizens in an ever-changing world.

Mission: *Scientifically literate students possess the knowledge and understanding of scientific concepts and processes required for personal decision-making, participation in civic and cultural affairs, and economic productivity.*

Vision: A quality science education fosters a population that:

- Experiences the richness and excitement of knowing about the natural world and understanding how it functions.
- Uses appropriate scientific processes and principles in making personal decisions.
- Engages intelligently in public discourse and debate about matters of scientific and technological concern.
- Applies scientific knowledge and skills to increase economic productivity.

The 2016 NJ science standards can be accessed at: http://www.state.nj.us/education/aps/cccs/science/

Assessment Note:
All 4th & 8th grade students take the state end of year assessment the NJ ASK or the Alternative Proficiency Assessment when applicable.

Unit Title: Matter and Energy in Organisms and Ecosystems
Grade Level: 6
Timeframe: 25 days (40 min class)

Essential Questions

How do changes in the availability of matter and energy effect populations in an ecosystem?
How do relationships among organisms, in an ecosystem, effect populations?
How can you explain the stability of an ecosystem by tracing the flow of matter and energy?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
MS-LS2-1, MS-LS2-2, and MS-LS2-3

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4
CRP6
CRP8
CRP11
CRP12

Instructional Plan	Reflection
Pre-assessment - Populations live in a variety of habitats, and change in those habitats affects the organisms living there. • Organisms can survive only in environments in which their particular needs are met. • A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. • Newly introduced species can damage the balance of an ecosystem. • The food of almost any animal can be traced back to plants. • Organisms are related in food webs, in which some animals eat plants for food and other animals eat the animals that eat plants; eventually, decomposers restore some materials to the soil. • Matter cycles between the air and soil and among organisms as they live and die and among plants, animals, and microbes as these organisms live and die. • Organisms obtain gases and water from the environment and release waste matter (gas, liquid, or solid) back into the environment. • Adult plants and animals can have young. • In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem	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	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Use cause-and-effect relationships to predict the effect of resource availability on organisms and populations in natural systems.	Possible activities could include plant experiments (e.g., students could count the number of butterflies on brightly colored plants vs. the number of butterflies on other types of plants and record the data they collect in a table), using microscopes/magnifiers to view plant structures (e.g., dissecting a lily), going on field trips, both virtual and actual Students could then observe examples of animal behaviors (using videos, Internet resources, books, etc.) that could affect the probability of successful animal reproduction Macro to Micro Lesson 1 Macro to Micro Lesson 2 Macro to Micro Lesson 4	The levels of ecological organization. The difference between biotic and abiotic factors.
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.	Construct an explanation about interactions within ecosystems. Include qualitative or quantitative relationships between variables as part of explanations about interactions within ecosystems. Make predictions about the impact within and across ecosystems of	Students may be able to identify and describe possible cause-and-effect relationships in factors that contribute to the reproductive success of plants and animals by using probability data from the rapid-cycling Brassica rapa (Fast Plant) experiments and drawing conclusions about one relationship between animals and plants. Macro to Micro Lesson 5 Parts of a Cell Macro to Micro Lesson 7	How competition, predator/prey and mutualism affect populations. Various factors that affect population size. The roles of producers, consumers and decomposers.

		competitive, predatory, or mutually beneficial relationships as abiotic (e.g., floods, habitat loss) or biotic (e.g., predation) components change.		
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.]	Develop a model to describe the cycling of matter among living and nonliving parts of an ecosystem. Develop a model to describe the flow of energy among living and nonliving parts of ecosystem. Track the transfer of energy as energy flows through an ecosystem. Observe and measure patterns of objects and events in ecosystems.	students can present an oral and/or written argument supported by evidence and scientific reasoning that characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Students may use evidence from experiments or other sources to identify the role of pollinators in plant reproduction. Macro to Micro Lesson 7	How energy cycles through an ecosystem. How a food web shows the flow of energy.
Benchmark Assessment:				
Organisms and populations of organisms are dependent on their environmental interactions with other living things.	Organisms and populations of organisms are dependent on their environmental interactions with nonliving factors.	In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with others for limited resources.	Access to food, water, oxygen, or other resources constrain organisms' growth and reproduction.	Patterns of interactions can be used to make predictions about the relationships among and between organisms and abiotic components of ecosystems.

Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms..	Mutually beneficial interactions may become so interdependent that each organism requires the other for survival	The patterns of interactions of organisms with their environment, both its living and nonliving components, are shared.	Interactions within ecosystems have patterns that can be used to identify cause-and-effect relationships.	Patterns of interactions among organisms across multiple ecosystems can be predicted.
Food webs are models that demonstrate how matter and energy are transferred among producers, consumers, and decomposers as the three groups interact within an ecosystem.	Transfers of matter into and out of the physical environment occur at every level	Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments	Decomposers recycle nutrients from dead plant or animal matter back to the water in aquatic environments.	The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
The transfer of energy can be tracked as energy flows through an ecosystem.	Science assumes that objects and events in ecosystems occur in consistent patterns that are understandable through measurement and observation.			
Benchmark Assessment:				
Summative Written Assessments				
What are the different levels of ecology? What are the factors within an ecosystem? What are the requirements of living things? How do organisms compete for resources? What is the effect of predators in an ecosystem? What are the mutually beneficial relationships in an ecosystem? How is matter and energy transferred in food webs? What is the relationship among producers, consumers, and decomposers?				
Summative Performance Assessment				
Give examples of the levels of ecology. Give examples of competition, predator/prey and mutualism. Describe how organisms depend on their environment. Explain how population size changes based on various factors. Describe the roles of producers, consumers and decomposers. Describe the transfer of energy through organisms in a food chain.				

Unit Title: Structure and Function
Grade Level: 6
Timeframe: 15 days (40 min class)

Essential Questions

How will astrobiologists know if they have found life elsewhere in the solar system?

: How do the functions of cells support an entire organism?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
MS-LS1-1 and MS-LS-1-2

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4
CRP5
CRP6
CRP8
CRP9
CRP11
CRP12

Instructional Plan				Reflection
Pre-assessment - Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of	Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living	Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things. • Conduct an investigation to produce data supporting the concept that	Students will conduct investigations examining both living and nonliving things and using the data they collect as evidence for making this distinction. During this investigation, students will study living things that are made of cells,	All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may

cells	things may be made of one cell or many and varied cells.]	living things may be made of one cell or many and varied cells. • Distinguish between living and nonliving things. • Observe different types of cells that can be found in the makeup of living things.	either one cell or many different numbers and types of cells. Students will also study nonliving things, some of which are made up of cells. Students will understand that life is a quality that distinguishes living things—composed of living cells—from once-living things that have died or things that never lived. Emphasis is on students beginning to understand the cell theory by developing evidence that living things are made of cells, distinguishing between living and nonliving things, and understanding that living things may be made of one cell or many and varied cells. Students will pose a question drawn from their investigations and draw on several sources to generate additional related, focused questions that allow for multiple avenues of exploration. They will conduct a short research project to collect evidence to develop and support their answers to the questions they generate. The report created from their research will integrate multimedia and visual displays of cells and specific cell parts into a presentation that will clarify the answers to their questions. Students will include in their reports variables representing two quantities, such as the number of cells that makes up an organism and units representing the size or	consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).

			type of the organism, and their conclusion about the relationship between these two variables. They will 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. Students will analyze the relationship between the dependent and independent variables using graphs and tables and relate the graphs and tables to the equation.	
Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	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.	• Develop and use a model to describe the function of a cell as a whole. • Develop and use a model to describe how parts of cells contribute to the cell's function. • Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.	Students will study the structure of the cell. This study begins with thinking of the cell as a system that is made up of parts, each of which has a function that contributes to the overall function of the cell. Students will learn that within cells, special structures—such as the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall—are responsible for particular functions. It is important to remember that students are required only to study the functions of these organelles in terms of how they contribute to the overall function of the cell, not in terms of their biochemical functions. As part of their learning about the structure of the cell, students use models as a way of visualizing and representing structures that are microscopic. Students will develop and use a model to describe the function of	Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.

			the cell as a whole and the ways parts of the cell contribute to the cell's function. Models can be made of a variety of materials, including student-generated drawings, digital representations, or 3-D structures. Students will examine the structure and function relationship of the cell membrane and the cell wall. They will learn that the structure of the cell membrane makes it possible for it to form the boundary that controls what enters and leaves the cell. They will also learn that the structure of the cell wall makes it possible for it to serve its function. This study of the relationship between structure and function will be limited to the cell wall and cell membrane.	
Benchmark Assessment:				
Distinguish between living and nonliving things.	Cells are the smallest unit of life that can be said to be alive.	All living things are made up of cells, either one cell or many different numbers and types of cells.	Organisms may consist of one single cell (unicellular).	Nonliving things can be composed of cells.
Organisms may consist of many different numbers and types of cells (multicellular).	Cells that can be observed at one scale may not be observable at another scale.	Engineering advances have led to important discoveries in the field of cell biology, and scientific discoveries have led to the development of entire industries and engineered systems.	The cell functions as a whole system.	Identify parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.
Within cells, special structures are responsible for particular functions.	Within cells, the cell membrane forms the boundary that controls what enters and leaves	Complex and microscopic structures and systems in cells can be visualized, modeled, and used to describe how the	Complex natural structures/systems can be analyzed to determine how they function.	A model can be used to describe the function of a cell as a whole.

	the cell.	function of the cell depends on the relationships among its parts.		
A model can be used to describe how parts of cells contribute to the cell's function.	The structures of the cell wall and cell membrane are related to their function.			
Benchmark Assessment:				
Summative Written Assessments				
1. What are the building blocks of life? 2. How does each part of a cell function? 3. How is the body a system of interacting subsystems composed of groups of cells? 4. What are fundamental differences between animal and plant cells pertaining to cell reproduction? 5. How do our sensory receptors send information to our brain?				
Summative Performance Assessment				
Determine whether something is living or non-living Explain how cells are the building blocks of life Build models of both a plant and animal cell and be able to demonstrate key characteristics that define both Describe how multicellular subsystems interact and work together to form tissue and organs that are specialized to particular body functions. Explain the similarities and differences between a chicken wing and a human arm Explain how our brain receives messages				

Unit Title:Body Systems **Grade Level: 6** **Timeframe: 15 days (40 min class)**
Essential Questions
What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells? How do organisms receive and respond to information from their environment?
Standards
Standards/Cumulative Progress Indicators (Taught and Assessed): MS-LS-1-3 and MS-LS-1-8

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4
CRP5
CRP6
CRP8
CRP9
CRP11
CRP12

Instructional Plan				Reflection
Pre-assessment - Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	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.	Use an oral and written argument supported by evidence to support or refute an explanation or a model of how the body is a system of interacting subsystems composed of groups of cells.	students will use informational text and models to support their understanding that the body is a system of interacting subsystems. Instruction should begin with students understanding that the cell is a specialized structure that is a functioning system. Students will need to understand that different types of cells have different functions; therefore, each cell system is specialized to perform its particular function. Building on this understanding, students learn that different types of cells serve as subsystems for larger systems called tissues. Groups of specialized tissues serve as subsystems for organs that then serve as subsystems for body systems such as the circulatory,	In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. Cells form tissues, which form organs, which form systems

			excretory, digestive, respiratory, muscular, and nervous systems. Students need to understand how each body system interacts with other body systems. Emphasis is on the conceptual understanding that each system and subsystem is specialized for particular body functions; it does not include the mechanisms of one body system independent of others. As part of their investigation of how body systems are interrelated, students should use variables to represent two quantities that describe how the inputs or outputs of one system change in relationship to another. They should 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 using graphs and tables; and relate these to the equation. For example, students can find the relationship between increased activity of the muscular system and the related increase in the activity of the circulatory or respiratory system and express this relationship as an equation.	
Gather and synthesize information that sensory receptors respond to stimuli by sending	Understand that the brain receives messages and decides to act or make a memory.	Gather, read, and synthesize information from multiple appropriate sources about sensory receptors' response to stimuli. • Assess the credibility, accuracy, and	Students will deepen their understanding of subsystems by gathering and synthesizing information about sensory receptors. Students will understand that sensory receptors respond to	Sensory receptors send messages to our brain

messages to the brain for immediate behavior or storage as memories.		possible bias of each publication and methods used. • Describe how publications and methods used are supported or not supported by evidence.	stimuli by sending messages to the brain for immediate behavior or storage as memories. Each sensory receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. Each response can be examined as a cause-and-effect relationship that can be used to predict response to stimuli in natural systems. Each step in the stimulus/response pathway can be connected to students' previous study of systems and subsystems. For example, the nervous system includes receptors that are subsystems that respond to stimuli by sending messages to the brain. Using multiple appropriate sources, students will read and synthesize information and will assess the credibility, accuracy, and possible bias of publications and methods used, and describe how the information they read is or is not supported by evidence. For example, students could participate in class discussions in which they can investigate whether information they have read in publications agree with scientific findings or seem to be biased in order to advertise a product or support a position.	
Benchmark Assessment:				

In multicellular organisms, the body is a system of multiple, interacting subsystems.	Subsystems are groups of cells that work together to form tissues.	Organs are groups of tissues that work together to perform a particular body function.	Tissues and organs are specialized for particular body functions.	Systems may interact with other systems.
Systems may have subsystems and be part of larger complex systems.	Interactions are limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.	Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.		
Benchmark Assessment:				
Summative Written Assessments				
How is the body a system of interacting subsystems composed of groups of cells? How do our sensory receptors send information to our brain?				
Summative Performance Assessment				
Determine whether something is living or non-living Explain how cells are the building blocks of life Describe how multicellular subsystems interact and work together to form tissue and organs that are specialized to particular body functions. Explain how our brain receives messages				

Unit Title: Growth, Development, and Reproduction of Organisms **Grade Level: 6** **Timeframe: 25 days (40 min class)**
Essential Questions
How do characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively? How do environmental and genetic factors influence the growth of organisms?
Standards
Standards/Cumulative Progress Indicators (Taught and Assessed):

MS-LS1-4 and MS-LS1-5

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4
CRP5
CRP6
CRP8
CRP9
CRP11
CRP12

Instructional Plan				Reflection
Pre-assessment -Reproduction is essential to every kind of organism. • Organisms have unique and diverse life cycles. • Organisms have both internal and macroscopic structures that allow for growth, survival, behavior, and reproduction.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively	Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting	Collect empirical evidence about animal behaviors that affect the animals' probability of successful reproduction and also affect the probability of plant reproduction. • Collect empirical evidence about plant structures that are specialized for reproductive success. • Use empirical evidence from experiments and other scientific reasoning to support oral and written arguments that explain the relationship among plant structure, animal behavior, and the reproductive success of plants. • Identify and	Students may observe examples of plant structures that could affect the probability of plant reproduction, including bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract pollen-transferring insects, and hard shells on nuts that squirrels bury. Possible activities could include plant experiments (e.g., students could count the number of butterflies on brightly colored plants vs. the number of butterflies on other types of plants and record the data they collect in a table), using microscopes/magnifiers to view plant structures (e.g., dissecting a lily), going on field trips, both virtual and actual (e.g., butterfly garden/botanical garden).	The stages of mitosis Simple meiosis Land and aquatic fertilization strategies Asexual and sexual reproduction How behavior effects survival and reproduction Animal parenting methods

	butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury	describe possible cause-and effect relationships affecting the reproductive success of plants and animals using probability. • Support or refute an explanation of how characteristic animal behaviors and specialized plant structures affect the probability of successful plant reproduction using oral and written arguments.	Students may observe examples of animal behaviors that affect the probability of plant reproduction, which could include observing how animals can transfer pollen or seeds and how animals can create conditions for seed germination and growth (e.g., students may conduct an experiment using rapid cycling Brassica rapa [Fast Plant] and collect data on how many plants produce seeds with and without the aid of a pollinator. Macro to Micro Lesson 8	
Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms	Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]	Conduct experiments, collect evidence, and analyze empirical data. • Use evidence from experiments and other scientific reasoning to support oral and written explanations of how environmental and genetic factors influence the growth of organisms. • Identify and describe possible causes and effects of local environmental conditions on the growth of organisms. • Identify and describe possible causes and effects of genetic conditions on the growth of organisms.	Students could then observe examples of animal behaviors (using videos, Internet resources, books, etc.) that could affect the probability of successful animal reproduction. These behaviors could include nest building to protect young from cold, herding of animals to protect young from predators, and colorful plumage and vocalizations to attract mates for breeding. Students may be able to identify and describe possible cause-and-effect relationships in factors that contribute to the reproductive success of plants and animals by using probability data from the rapid-cycling Brassica rapa (Fast Plant) experiments and drawing conclusions about one relationship between animals and plants.	Flower structure How the environment effects growth and reproduction Reproductive success is measured in the number of offspring which survive to reproduce

			Macro to Micro Lesson 9	
Benchmark Assessment:				
Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. There are a variety of ways that plants reproduce.	Specialized structures for plants affect their probability of successful reproduction.	Some characteristic animal behaviors affect the probability of successful reproduction in plants.	Animals engage in characteristic behaviors that affect the probability of successful reproduction.	There are a variety of characteristic animal behaviors that affect their probability of successful reproduction.
There are a variety of animal behaviors that attract a mate.	Successful reproduction of animals and plants may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	Genetic factors as well as local conditions affect the growth of organisms. A variety of local environmental conditions affect the growth of organisms.	Genetic factors affect the growth of organisms (plant and animal).	The factors that influence the growth of organisms may have more than one cause.
Some cause-and-effect relationships in plant and animal systems can only be described using probability.				
Benchmark Assessment:				
Summative Written Assessments				
How do organisms reproduce? What is the difference between sexual and asexual reproduction? How can an organism's behavior increase its chance of survival and reproduction? What structures or mechanisms aid in plant reproduction? How does the environment contribute to successful reproduction or growth? How do genetic factors influence the growth of organisms? How do natural differences in organisms increase survival and reproduction?				
Summative Performance Assessment				
Show the order of mitosis given pictures, name the function of mitotic structures Differentiate between animal types and reproductive strategies Identify extreme structures for attracting mates Identify behaviors which enhance reproductive success Differentiate between aquatic and land fertilization and development of young Compare parenting styles of animals				

Compare pollination types Dissect and identify flower structures and function Distinguish between different types of pollen Compare fruits, nuts and seeds Identify environmental effects on growth Argue the importance of nurture vs. nature	

Unit Title: Inheritance and Variation of Traits
Grade Level: 6
Timeframe: 20 days (40 min class)

Essential Questions

How do structural changes to genes (mutations) located on chromosomes affect proteins or affect the structure and function of an organism?

How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
MS-LS3-1 and MS-LS3-2

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4
CRP5
CRP6
CRP8
CRP9
CRP11
CRP12

Instructional Plan	Reflection
Pre-assessment - Many characteristics of organisms are inherited from parents. • Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. • Different organisms vary in how they look and function because they have different inherited information. • The environment also affects the traits that an organism develops.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
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.	Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins	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.	Using models, such as electronic simulations, physical models, or drawings, students will learn that genes are located in the chromosomes of cells and each chromosome pair contains two variants of each gene. Students will need to make distinctions between chromosomes and genes and understand the connections between them. DNA will be introduced in high school. Students will learn that chromosomes are the genetic material that is found in the nucleus of the cell and that chromosomes are made up of genes. They will also learn that each gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual. Use student-developed conceptual models to visualize how a mutation of genetic material could have positive, negative, or neutral impact on the expression of traits in organisms. Emphasis in this unit is on conceptual understanding that mutations of the genetic material may result in	How to properly use a Punnett Square • The difference between genotype and phenotype and how phenotype depends on genotype • How to perform a test cross to determine the unknown genotype of an organism • Why a person may end up being born with a birth defect or disease

			making different proteins; therefore, models and activities that focus on the expression of genetic traits, rather than on the molecular-level mechanisms for protein synthesis or specific types of mutations, are important for this unit of study. For example, models that assign genetic information to specific segments of model chromosomes could be used. Students could add, remove, or exchange genes located on the chromosomes and see that changing or altering a gene can result in a change in gene expression (proteins and therefore traits). Macro to Micro Lesson 18 Macro to Micro Lesson 19	
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	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	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information. • Develop and use a model to describe why sexual reproduction results in offspring with genetic variation. • Use models such as Punnett squares, diagrams, and simulations to describe the cause-and effect-relationship of gene transmission from parent(s)	Describe two of the most common sources of genetic variation, sexual and asexual reproduction. Students will be able to show that in sexual reproduction, each parent contributes half of the genes acquired by offspring, whereas in asexual reproduction, a single parent contributes the genetic makeup of offspring. Using models such as Punnett squares, diagrams, and simulations, students will	• Your traits are determined by the dominant and recessive alleles passed to you from your parents Asexual traits are passed on from the single parent.

		to offspring and resulting genetic variation.	describe the cause-and-effect relationship between gene transmission from parents(s) to offspring and the resulting genetic variation. Using symbols to represent the two alleles of a gene, one acquired from each parent, students can use Punnett squares to model how sexual reproduction results in offspring that may or may not have a genetic makeup that is different from either parent. Students can observe the same mixing of genetic information using colored counters or electronic simulations. Using other models, students can show that asexual reproduction results in offspring with the same combination of genetic information as the parents.	
Benchmark Assessment:				
Complex and microscopic structures and systems, such as genes located on chromosomes, can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among the parts of the system; therefore, complex natural structures/systems can be analyzed to determine how they	Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes.	Each distinct gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual.	In addition to variations that arise from sexual reproduction, genetic information can be altered due to mutations.	Some changes to genetic material are beneficial, others harmful, and some neutral to the organism.

function.				
Changes in genetic material may result in the production of different proteins.	Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.	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	Though rare, mutations may result in changes to the structure and function of proteins.	Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring.
Asexual reproduction results in offspring with identical genetic information..	Sexual reproduction results in offspring with genetic variation.	Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited	In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring.	Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.
Punnett squares, diagrams, and simulations can be used to describe the cause-and-effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.				
Benchmark Assessment:				
Summative Written Assessments				
How do children get traits from their parents? Why do some people look more like their dad and some look more like their mom? What is a Punnett Square and how does it help us predict the traits of offspring? Why do some children show traits that neither of their parents display? Why are some people born with birth defects or diseases?				
Summative Performance Assessment				
Properly complete a Punnett Square and use it to predict the genes of offspring •Use an organism's genotype to describe the physical characteristics of the object • Properly perform test crosses to determine an unknown genotype • Demonstrate appropriate research skills and teach the class about birth defects and genetic mutations				

Unit Title: Selection and Adaptation Grade Level: 6 Timeframe: 20 days (40 min class)
Essential Questions
How can changes to the genetic code increase or decrease an individual's chances of survival? How can the environment effect natural selection? Are Genetically Modified Organisms (GMO) safe to eat?
Standards
Standards/Cumulative Progress Indicators (Taught and Assessed): MS-LS-4-4, MS-LS-4-5, and MS-LS-4-6 **Highlighted Career Ready Practices:** CRP1 CRP2 CRP4 CRP5 CRP6 CRP8 CRP9 CRP11 CRP12

Instructional Plan				Reflection
Pre-assessment -Different organisms vary in how they look and function because they have different inherited information. • The environment also affects the traits that an organism develops. • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Construct an explanation based on evidence that describes	Emphasis is on using simple probability statements and proportional	Construct an explanation that includes probability statements regarding	Students will summarize these numerical data sets and construct explanations for how the	How fossils are creates, types of fossils and the

how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	reasoning to construct explanations]	variables and proportional reasoning of how genetic variations of traits in a population increase some individuals' probability surviving and reproducing in a specific environment. • Use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment.	proportional relationship could impact the probability of some individuals surviving and reproducing in a specific environment. Students will construct explanations based on evidence that describes how genetic variations can provide a survival and reproductive advantage over other traits. This evidence could be provided through activities that model these phenomena or by examining and analyzing data from informative texts. Students will compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading these texts and write informative/explanatory texts on how natural selection leads to the predominance of some traits and the suppression of others in a population.	transformational methods. How fossils are dated and what they reveal about Earth's history.
Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	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	Explain some causes of natural selection and the effect it has on the increase or decrease of specific traits in populations over time. • Use mathematical representations to support conclusions about how natural selection may lead to increases and decreases of genetic traits in populations over time.	Students will examine a variety of environmental factors that may influence the natural selection that is taking place in populations. Students will need to use simple probability statements and proportional reasoning to explain why each factor may or may not be responsible for the changes being observed. Students will compare and contrast the information gained from experiments, simulations, video, or multimedia sources with information gained from reading science and	Why a person may end up being born with a birth defect or disease

			technical texts to support their explanations. After students have constructed their explanations, they will participate in collaborative discussions in small groups; in larger, teacherled groups, or in pair. After students have developed a strong understanding of natural selection, they will need to begin gathering evidence from multiple sources, including print and digital, to support analysis of information about technologies that have changed how humans can influence the inheritance of desired traits in organisms (artificial selection). Students need to examine current technologies as well as the technologies that have led to these scientific discoveries.	
Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time	Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time	Gather, read, and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) from multiple appropriate sources. • Describe how information from publications about technologies and methods that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) used are supported or not supported	Understand the concept of a ratio and use ratio language to describe a ratio relationship between specific genetic variations in a population and the probability of some individuals in that populations surviving and reproducing in a specific environment. Understand the concept of a ratio and use ratio language to describe a ratio relationship between natural selection and decreases of specific traits in populations over time.	How similarities and differences provide evidence for evolution

		by evidence. • • Assess the credibility, accuracy, and possible bias of publications and they methods they used when gathering information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection).		
Benchmark Assessment:				
Genetic variations of traits in a population increase or decrease some individuals' probability of surviving and reproducing in a specific environment.	Natural selection leads to the predominance of certain traits in a population and the suppression of others.	Natural selection may have more than one cause, and some cause-and-effect relationships within natural selection can only be described using probability.	Natural selection, which over generations leads to adaptations, is one important process through which species change over time in response to changes in environmental conditions.	The distribution of traits in a population changes.
Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common	Natural selection may have more than one cause, and some cause-andeffect relationships in natural selection can only be described using probability.	Mathematical representations can be used to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding	In artificial selection, humans choose desirable, genetically determined traits in to pass on to offspring
Phenomena, such as genetic outcomes in artificial selection, may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.	Technologies have changed the way humans influence the inheritance of desired traits in organisms.	Engineering advances have led to important discoveries in the field of selective breeding.	Engineering advances in the field of selective breeding have led to the development of entire industries and engineered systems.	Scientific discoveries have led to the development of entire industries and engineered systems.

Benchmark Assessment:	
Summative Written Assessments	
How do anatomical similarities and differences help reconstruct evolutionary history? What is embryological development and how does it support a common ancestry? Why do some children show traits that neither of their parents display? 5. Why are some people born with birth defects or diseases?	
Summative Performance Assessment	
Describe the mechanisms for evolution. Describe the theory of evolution and common ancestry. Demonstrate appropriate research skills and teach the class about birth defects and genetic mutations	

Unit Title: Interdependent Relationships in Ecosystems **Grade Level: 6** **Timeframe: 25 days (40 min class)**
Essential Questions
How can a single change to an ecosystem disrupt the whole system? What limits the number and variety of living things in an ecosystem?
Standards
Standards/Cumulative Progress Indicators (Taught and Assessed): MS-ETS1-1, MS-ETS1-3, MS-LS2-4, and MS-LS2-5 **Highlighted Career Ready Practices:** CRP1 CRP2 CRP4 CRP5 CRP6 CRP8

CRP9 CRP11 CRP12

Instructional Plan				Reflection
Pre-assessment -When the environment changes in ways that affect a place's physical characteristics, temperature, or available resources, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. • Populations of organisms live in a variety of habitats. Changes in those habitats affect the organisms living there. • Research on a problem should be carried out before work to design a solution begins. Testing a solution involves investigating how well it performs under a range of likely conditions. • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations	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.	Construct an argument to support or refute an explanation for the changes to populations in an ecosystem caused by disruptions to a physical or biological component of that ecosystem. Empirical evidence and scientific reasoning must support the argument. • Use scientific rules for obtaining and evaluating empirical evidence. • Recognize patterns in data and make warranted inferences about changes in populations. • Evaluate empirical evidence supporting arguments about changes to ecosystems.	students will begin to collect empirical evidence that will be used to argue that physical or biological components of an ecosystem affect populations. Students will evaluate existing solutions for maintaining biodiversity and ecosystem services to determine which solutions are most promising. As part of their evaluation, students will develop a probability and use it to determine the probability that designed systems, including those representing inputs and outputs, will maintain biodiversity and ecosystem services. They will develop mathematical model(s) to generate data to test the	The relationships between biodiversity, resilience and disturbance. Examples of disturbances. How disturbances can affect an entire ecosystem. How levels of disturbances affect biodiversity. The steps of ecological succession.

			designed systems and compare probabilities from the models to observe frequencies. If the agreement is not good, they will explain possible sources of the discrepancy. Students will study the variety of species found in terrestrial and oceanic ecosystems and use the data they gather to make decisions about the health of the ecosystem. Students may compare, through observations and data analysis, the biodiversity before and after events affecting a specific area—for examples, the Pinelands, that were lost due to the creation of the reservoir; the underground coal fires in Centralia, PA, that caused people to abandon the town; the volcanic eruption in Mt. St. Helen's, WA; the nuclear reactor meltdown in Chernobyl, Ukraine.	
Evaluate competing design solutions for maintaining biodiversity and ecosystem services	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.	• Construct a convincing argument that supports or refutes claims for solutions about the natural and designed world(s). • Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. • Create design criteria for design solutions for maintaining	Students should recognize patterns in data about changes to components in ecosystems and make inferences about how these changes contribute to changes in the biodiversity of populations. Students should investigate and design investigations to test their ideas and develop possible solutions to problems caused	The many different ways in which humans benefit from the ecosystem. That ecosystem services are linked to biodiversity. The current state of the world's biodiversity is rapidly declining. By the end of this unit, students will be able to: Explain examples of each category of ecosystem services. Describe how

		biodiversity and ecosystem services. • Evaluate competing design solutions based on jointly developed and agreedupon design criteria.	when changes in the biodiversity of an ecosystem affect resources (food, energy, and medicine) as well as ecosystem services (water purification, nutrient recycling, soil erosion prevention) available to humans. Students can then construct arguments using evidence to support recognized patterns of change in factors such as global temperatures and their effect on populations and the environment. As part of their argument, students need to note how small changes in one part of an ecosystem might cause large changes in another part. While collecting evidence for their arguments about maintaining biodiversity, students will trace and evaluate specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. Students will evaluate the argument and claims in text, assess whether the reasoning is sound and the evidence is relevant and sufficient to support the claims	biodiversity is linked to each category of ecosystem services. Discuss different ways that a changing biodiversity can impact humans. www.njctl.org 6 th Grade PSI Biodiversity and Humans Most threats to habitats and ecosystems that cause biodiversity loss is caused by humans. Humans can conserve, preserve and restore ecosystems in order to support thriving biodiversity.
Benchmark Assessment:				

Ecosystems are dynamic in nature.	The characteristics of ecosystems can vary over time.	Disruptions to any physical or biological component of an ecosystem can lead to shifts in all the ecosystem's populations.	Small changes in one part of an ecosystem might cause large changes in another part.	Patterns in data about ecosystems can be recognized and used to make warranted inferences about changes in populations.
Evaluating empirical evidence can be used to support arguments about changes to ecosystems	Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems.	The completeness, or integrity, of an ecosystem's biodiversity is often used as a measure of its health.	Changes in biodiversity can influence humans' resources, such as food, energy, and medicines.	Changes in biodiversity can influence ecosystem services that humans rely on.
There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	A solution needs to be tested and then modified on the basis of the test results, in order to improve it.	Models of all kinds are important for testing solutions.	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	Small changes in one part of a system might cause large changes in another part.
Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.				
Benchmark Assessment:				
Summative Written Assessments				
What is biodiversity? What is ecosystem resilience? What is the relationship between biodiversity and resilience? What is a disturbance? How does a disturbance to one part of an ecosystem affect other parts of an ecosystem? What is the relationship between disturbance and biodiversity? What are the steps to ecological succession? What is an ecosystem service? What are the four categories of ecosystem services? How are ecosystem services linked to biodiversity? What are threats to biodiversity? How can biodiversity be conserved?				

How can ecosystems be restored?	
Summative Performance Assessment	
Describe biodiversity, resilience and disturbance. Explain the relationship between biodiversity and ecosystem resilience. Describe examples of how disturbances affect entire ecosystems. Explain the relationship between disturbances and biodiversity. Contrast primary and secondary succession. Describe how soil is created during succession. Explain examples of each category of ecosystem services. Describe how biodiversity is linked to each category of ecosystem services. Discuss different ways that a changing biodiversity can impact humans. Identify and describe the threats that contribute to the decline of biodiversity (overexploitation and extinction, habitat destruction, habitat fragmentation, pollution, acid rain, invasive species, climate change). Describe methods used to conserve, preserve and restore ecosystems and hence, biodiversity. Evaluate conservation/preservation and restoration methods to determine how well they meet certain criteria for different scenarios.	

Unit Title: Astronomy
Grade Level: 6
Timeframe: 20 days (40 min class)

Essential Questions

What pattern in the Earth–sun–moon system can be used to explain lunar phases, eclipses of the sun and moon, and seasons?

What is the role of gravity in the motions within galaxies and the solar system?

What are the scale properties of objects in the solar system?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
MS-ESS1-1, MS-ESS1-2, and MS-ESS1-3

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4

CRP5
CRP6
CRP8
CRP9
CRP11
CRP12

Instructional Plan				Reflection
Pre-assessment - Earth's orbit and rotation and the orbit of the moon around Earth cause observable patterns. • Certain features on Earth can be used to order events that have occurred in a landscape.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	Examples of models can be physical, graphical, or conceptual	Students will develop and use a physical, graphical, or conceptual model to describe patterns in the apparent motion of the sun, moon, and stars in the sky.	Students will develop and use mathematical, physical, graphical or conceptual models to describe the cyclical patterns of lunar phases, eclipses of the sun and moon, and seasons. Students can use mathematics to create scale models of the solar system to investigate relative distances between the planets and their orbits around the sun or to represent the distance from the sun to the Earth during different Earth seasons. Students can also use physical models to examine the phases of the moon using a light source and a moon model to view the various shapes of the moon as it orbits the earth. Students may also keep a lunar calendar for one month and analyze the results by looking for differences and patterns. Using a model of the sun, Earth, and moon, students can view the positions of these	Characteristics of various celestial bodies, including the Sun and the Moon What causes the tides, solar/lunar eclipses, and seasons

			planetary objects during a solar or lunar eclipse. To investigate seasons, students can simulate the position and tilt of the Earth as it revolves around the sun, using computer simulations, hands-on models, and videos.	
Analyze and interpret data to determine scale properties of objects in the solar system.	Emphasis is on the analysis of data from Earth based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models	Students develop and use models to explain the relationship between the tilt of Earth's axis and seasons.	Students will also analyze and interpret data from Earth-based instruments to determine the scale properties of objects within our solar system. Examples of models that students could use include physical (such as the analogy of distance along a football field or computer visualization of elliptical orbits), conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state). Students can construct scale models of the solar system that will help them visualize relative sizes of objects in the system as well as distances between objects. Students can use graphs or tables to make comparisons between the size and gravitational pull of the planets and their moons.	The brightness of a star depends on its distance and size.
Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system	Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them.	Analyze and interpret data to determine similarities and differences among objects in the solar	Students will explore, through the development and use of models, the role of the force of gravity in explaining the motions within our solar system	Celestial bodies (planets, stars, moons, etc) are formed and are held in orbit by the force of gravity.

	Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state)	system.	and the Milky Way Galaxy. As part of their study of the solar system and its components, including the sun, planets and their moons, and asteroids, they will use models and examine simulations to determine how gravity holds these systems together. To visualize how gravity pulls objects down towards its center, students can experiment with dropping spheres of different masses but of the same diameter as a way to determine that gravity acts on both objects and that they drop at the same rate. If technology is available, students can measure the acceleration of the objects as they fall from various heights. Students will be able to determine that the objects speed up as they fall, therefore proving that a force is acting on them. If motion detectors are not available for student use, they could observe these using simulations.	
Benchmark Assessment:				
Patterns in the apparent motion of the sun, moon, and stars in the sky can be observed, described, predicted, and explained with models.	The Earth and solar system model of the solar system can explain eclipses of the sun and the moon.	Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun.	The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.	Patterns can be used to identify cause-and-effect relationships that exist in the apparent motion of the sun, moon, and stars in the sky.

Science assumes that objects and events in the solar system systems occur in consistent patterns that are understandable through measurement and observation.	Gravity plays a role in the motions within galaxies and the solar system.	Gravity is the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them.	Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.	The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids, that are held in orbit around the sun by its gravitational pull on them.
The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.	Models can be used to represent the role of gravity in the motions and interactions within galaxies and the solar system.	Science assumes that objects and events in the solar systems occur in consistent patterns that are understandable through measurement and observation.	Objects in the solar system have scale properties.	Data from Earth-based instruments, space-based telescopes, and spacecraft can be used to determine similarities and differences among solar system objects
The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.	Time, space, and energy phenomena in the solar system can be observed at various scales, using models to study systems that are too large.	Engineering advances have led to important discoveries in space science, and scientific discoveries have led to the development of entire industries and engineered systems.		
Benchmark Assessment:				
Summative Written Assessments				
What different types of objects can be found in our solar system? Why do the objects in our solar system follow a curved path around our Sun? What effects do the Moon and Sun have on us here on Earth? What holds our galaxy and solar system together? What determined the brightness of a star, and what are the properties of our Sun?				
Summative Performance Assessment				
Describe the celestial bodies in our solar system Explain what effects the motions of the Earth, Sun and Moon have on us (particularly the Tides, Eclipses, and Seasons). Identify the factors that determine the strength of gravity and explain gravity's role in our universe Describe the makeup of a star and the factors that determine a star's brightness				

Unit Title: Weather and Climate
Grade Level: 6
Timeframe: 20 days (40 min class)

Essential Questions

What factors affect weather and climate?

What are natural disasters and how are they predicted?

What is the water cycle?

How is water recycled?

What effect does sunlight and gravity have on the water cycle?

What causes the ocean currents and tides?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
MS-ESS2-4, MS-ESS2-5, and MS-ESS2-6

Highlighted Career Ready Practices:
CRP1
CRP2
CRP4
CRP5
CRP6
CRP8
CRP9
CRP11
CRP12

Instructional Plan	Reflection
Pre-assessment - Most of the Earth's water is in the ocean, and much of the Earth's fresh water is in glaciers or underground. Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity	*Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical*	*Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.* *Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.* *Model the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle.*	Models will be created and emphasis will be on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Students will model the continuous movement of water from land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation. Students will focus on the global movement of water and its changes in form that are driven by sunlight as it heats the Earth's surface water.	How atmospheric and oceanic circulation occurs. Stages of the water cycle, including relevant vocabulary. What causes global movement of water.
Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions	*Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation)*	*Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.* Collect data to serve as the basis for evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	Students will collect data from weather maps, diagrams, visualizations, and laboratory experiments to explain how the movements of air masses from regions of high pressure to regions of low pressure cause weather at a fixed location. For example, students can observe the movement of colored water that simulates the movement of hot and cold air masses. Students can observe the cooler water flowing in the direction of the warmer area and equate this with wind being created from the uneven heating of the Earth. Students will compare data collected from sources such as simulations, video, or experiments to identify the patterns of change in the movement of water in the atmosphere that are used to make weather predictions, understanding that any predictions	The effect that various factors have on weather and climate. What natural disasters are how they are predicted

			are reported within probability ranges. Students will also make predictions about the conditions that result in sudden changes in weather. Catastrophic Events Lessons: 2, 3	
Explain how variations in density result from variations in temperature and salinity drive a global pattern of interconnected ocean currents. Use a model to explain the mechanisms that cause varying daily temperature ranges in a coastal community and in a community located in the interior of the country. **Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates**	*Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.*	*Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.*	Digital models like NOAA videos can be used to help students visualize how variations in density due to temperature and salinity drive a global pattern of interconnected ocean currents. This can be demonstrated in the classroom using models in which colored water with different temperatures or water with different densities is added to clear tubs of water. Students can observe that the warmer water is pushed upwards by the colder water. This same demonstration can be used with water that has different salinities. Catastrophic Events Lessons: 4. 5. 6	How differences in temperature and salinity form a global pattern of currents. How atmospheric and oceanic circulation occurs.
Benchmark Assessment:				
Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.	Global movements of water and its changes in form are propelled by sunlight and gravity.	The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity	Within Earth's systems, the transfer of energy drives the motion and/or cycling of water	The motions and complex interactions of air masses result in changes in weather conditions
The complex patterns of the changes in and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns	Examples of data that can be used to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions include weather maps, diagrams, and visualizations; other examples can be obtained through laboratory experiments	Air masses flow from regions of high pressure to regions of low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time	Because patterns of the changes and the movement of water in the atmosphere are so complex, weather can only be predicted probabilistically	Sudden changes in weather can result when different air masses collide
Weather can be predicted within probabilistic ranges	Cause-and effect-relationships may be used to predict changes in weather	Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic	Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution	Atmospheric circulation that, in part, determines regional climates is

		circulation that determine regional climates		the result of sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds
Ocean circulation that, in part, determines regional climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents	Models that can be used to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates can be diagrams, maps and globes, or digital representations			
Benchmark Assessment:				
Summative Written Assessments				
What is the water cycle? How is water recycled? What effect does sunlight and gravity have on the water cycle? What causes the ocean currents and tides? What factors affect weather and climate? What are natural disasters and how are they predicted?				
Summative Performance Assessment				
Describe the water cycle and the forces that drive it. Explain the impact of sunlight and gravity on global movements of water. Identify the global pattern of interconnected ocean currents. Describe the effects that factors and locations have on weather and climate. Describe how circulation transports heat and moisture around the Earth. Explain how natural disasters can be predicted.				