SOMERS POINT
SCHOOL DISTRICT
the learning starts here!℠

Curriculum

Science

Grade 7

Board Approved: August 2017

SOMERS POINT SCHOOL DISTRICT

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Somers Point Schools

This document reflects the collaboration of teachers, staff, students, parents, and the Board of Education to define our mission, vision and beliefs to guide our work.

Our Mission

Empower each student to make responsible choices, meet challenges, achieve personal success, and 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. This is accomplished through:

- *Offering diverse, challenging, effective and progressive programs in a safe, nurturing environment*
- *Providing optimal facilities and resources*
- *Mastering the skills and tools needed for success*
- *Facilitating an educational partnership with home, school and community*

Our 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 who 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
- Value the integrity of all individuals and recognize their own ability to progress academically, socially, and emotionally

Our Vision

The students of the Somers Point School District will demonstrate personal growth over time in relation to individualized goals aligned to the New Jersey Core Content Curriculum Standards. Achievement is evident when students:

- Take academic risks
- Transfer or extend content area knowledge
- Are intrinsically motivated life-long learners
- Are global learners who collaborate beyond the confines of the classroom or school
- Demonstrate social growth
- Are meta-cognitive thinkers
- Solve real-world problems

To foster student achievement Somers Point Educators:

- Promote student-centered learning
- Explicitly communicate the purpose of the lesson and how it fits into students' broader learning
- Provide hands-on learning activities
- Encourage collaboration
- Cultivate a safe environment and a strong classroom community
- Differentiate instruction
- Know the content area, curriculum, and their students
- Integrate technology
- Uncover and capitalize on student interests
- Use assessment data to make instructional decisions
- Commit to life-long learning to improve their practice

INTRODUCTION, PHILOSOPHY OF EDUCATION, AND EDUCATIONAL GOALS

Philosophy

Somers Point Schools will help students understand their past and present to become responsible and productive citizens in a democratic society and a globally interdependent world. Through an integrated study of social studies our mission is to provide learners with the knowledge, skills and attitudes they need to be active, informed citizens and contributing members of local, state and world communities.

Educational Goals & Beliefs

• All students learn through a variety of relevant experiences. Therefore, we will provide interactions that activate and build on prior knowledge and promote higher level thinking skills.
• Research shows active learning is essential. Therefore, we will provide students with a variety of active, student-centered, multisensory learning opportunities.
• Instruction should be relevant, meaningful, and based on student needs. Therefore, we will provide opportunities for students to make connections to their own lives using a variety of instructional strategies.
• The world is constantly changing. Therefore, we will provide the opportunities for students to understand that the present connects to the past and affects the future.
• We live in a culturally diverse, global society. Therefore, we will develop student understanding of diverse cultures that honors equality and human dignity.
• Assessment should be ongoing, diagnostic, and aligned with instruction. Therefore, we will provide multiple authentic assessment tools.
• The use of community resources is essential for effective instruction. Therefore, we will use the rich history and ethnic diversity of our community to enhance learning.
• Active and informed citizen participation is essential to democracy. Therefore, we will provide instruction and curriculum designed to develop students who will be informed, active problem solvers, and willing participants in the democratic process.
• Students are citizens of a connected, digital society. Therefore they will utilize technology as a tool to solve problems and build relationships.

New Jersey State Department of Education
New Jersey Student Learning 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.**

Then New Jersey Student Learning Standards for science 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.

Unit Title: Force and Motion
Grade Level:7th
Timeframe: 25 days

Essential Questions

How can we predict the motion of an object?
What causes motion to occur? What do motion graphs look like for objects moving with constant velocity? What do graphs look like for objects that are accelerating? How is the speed of an object calculated? How is velocity similar / different from velocity? How is acceleration calculated? How do unbalanced forces affect the motion of an object? How does friction affect an object when at rest or in motion? What are the biggest factors that affect the force of gravity? How is weight calculated? What does Newton's 1st law state about objects at rest or in motion? How does the mass of an object and the force acting on that object affect the object's acceleration? How can Newton's 3rd law of motion be used to explain the motion of a rocket? What factors affect the momentum of an object? How is momentum different from inertia?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

This unit is based on MS-PS2-1, MS-PS2-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4

Highlighted Career Ready Practices: http://www.nj.gov/education/cte/hl/CRP.pdf

Use Technology to Enhance Productivity
Apply appropriate academic and technical skills
Communicate Clearly and Effectively and with Reason
Utilize Critical Thinking to Make Sense of Problems and Persevere in Solving Them

Instructional Plan				Reflection
Pre-assessment; • Each force acts on one particular object and has both strength and a direction. • An object at rest typically has multiple forces acting on it, but these forces add to give zero net force on the object. • Forces that do not sum to zero can cause changes in the object's speed or direction of motion. • The patterns of an object's motion in various situations can be observed and measured; when the past motion exhibits a regular pattern, future motion can be predicted from it. • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	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	Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects. • Define a design problem involving the motion of two colliding objects that can be solved through the development of an object, tool, process, or system and that includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. • Evaluate competing design solutions involving the motion of two colliding objects based on jointly developed and agreed-upon design criteria. • Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. • Analyze and interpret data to determine similarities and differences in findings.	Throughout this unit of study, students will be examining and interacting with objects in motion. They will begin this unit by investigating Newton's third law of motion by observing the action/reaction forces involved during a collision. For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1) The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2) All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and	By the end of this unit, students will know: The causes of motion. The difference between speed and velocity. Unbalanced forces cause acceleration. The larger the force the larger the acceleration. The inverse relationship between mass and acceleration. Newton's 3rd law acts in force pairs

			arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)	

Benchmark Assessment:• For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). • Models can be used to represent the motion of objects in colliding systems and their interactions, such as inputs, processes, and outputs, as well as energy and matter flows within systems. • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values, by the findings of scientific research and by differences in such factors as climate, natural resources, and economic conditions. • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. • Specification of constraints includes consideration of scientific principles and other relevant knowledge, which are likely to limit possible solutions.

Summative Written Assessments

What causes motion to occur? What do motion graphs look like for objects moving with constant velocity? What do graphs look like for objects that are accelerating? How is the speed of an object calculated? How is velocity similar / different from velocity? How is acceleration calculated? How do unbalanced forces affect the motion of an object? How does friction affect an object when at rest or in motion? What are the biggest factors that affect the force of gravity? How is weight calculated? What does Newton's 1st law state about objects at rest or in motion? How does the mass of an object and the force acting on that object affect the object's acceleration? How can Newton's 3rd law of motion be used to explain the motion of a rocket? What factors affect the momentum of an object? How is momentum different from inertia?

Summative Performance Assessment

By the end of this unit, students will be able to: Interpret motion graphs Calculate speed. Calculate Weight. Calculate Force. Explain any moving object using Newton's Laws. Calculate momentum. Calculate basic sum of force problems.

Unit Title: Growth, Development, and Reproduction of Organisms

Grade Level: 7th
Timeframe: 25 days

Essential Questions

1. How do organisms reproduce?
2. What is the difference between sexual and asexual reproduction?
3. How can an organism's behavior increase its chance of survival and reproduction?
4. What structures or mechanisms aid in plant reproduction?
5. How does the environment contribute to successful reproduction or growth?
6. How do genetic factors influence the growth of organisms?
7. How do natural differences in organisms increase survival and reproduction?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

Science Standards: MS-LS1-4, and MS-LS1-5

Highlighted Career Ready Practices:

- Knowing, using, and interpreting scientific explanations of the natural world (disciplinary core ideas and crosscutting concepts)
- Generating and evaluating scientific evidence and explanations (practices)
- Participating productively in scientific practices and discourse (practices)
- Understanding the nature and development of scientific knowledge (practices and crosscutting concepts)

Instructional Plan	Reflection
Pre-Assessment: Students should know: • 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. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	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 butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could	Students who understand the concepts are able to: • 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 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 who understand the concepts are able to: • Conduct experiments, collect evidence, and analyze empirical data. • Use evidence from experiments and other scientific reasoning to support oral and written explanations of how	Animals engage in characteristic behaviors that increase the odds of reproduction (MS-LS1-4) Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction (MS-LS1-4) Genetic factors as well as local conditions affect the growth of the adult plant (MS-LS1-5) Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring (secondary to MS-LS3-2) http://www.nextgenscience.org/msls1-molecules-organisms-structuresprocesses http://www.nextgenscience.org/msls3-heredity-inheritance-variation-traits Use an 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 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms 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	By the end of this unit, students will know: The stages of mitosis Simple meiosis Land and aquatic fertilization strategies Asexual and sexual reproduction How behavior effects survival and reproduction Animal parenting methods Flower structure How the environment effects growth and reproduction Reproductive success is measured in the number of offspring which survive to reproduce

	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.	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.		
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.				
Summative Written Assessments				
Questions the students will be able to answer as a result of the instruction: 1. How do organisms reproduce? 2. What is the difference between sexual and asexual reproduction? 3. How can an organism's behavior increase its chance of survival and reproduction? 4. What structures or mechanisms aid in plant reproduction? 5. How does the environment contribute to successful reproduction or growth? 6. How do genetic factors influence the growth of organisms? 7. How do natural differences in organisms increase survival and reproduction?				
Summative Performance Assessment				

By the end of this unit, students will be able to: 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 https://njctl.org/courses/science/7th-grade-science/growth-and-development-of-organisms/ http://www.state.nj.us/education/modelcurriculum/sci/6u1.pdf	

Unit Title: The Electromagnetic Spectrum/
Electromagnetic Radiation
Grade Level: 7th
Timeframe: 20 days

Essential Questions

1. What is radiation?
2. How are light waves and mechanical waves different?
3. What is the relationship between wavelength, frequency and energy of electromagnetic radiation?
4. What are the different types of electromagnetic radiation?
5. What are the different types of reflection?
6. How does the absorption of light result in the different colors that we see?
7. How do objects refract through different mediums?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

This unit is based on MS-PS4-1, MS-PS4-2, and MS-PS4-3.

Highlighted Career Ready Practices:http://www.nj.gov/education/cte/hl/CRP.pdf

Use Technology to Enhance Productivity
Apply appropriate academic and technical skills
Communicate Clearly and Effectively and with Reason
Utilize Critical Thinking to Make Sense of Problems and Persevere in Solving Them

Instructional Plan	Reflection
Pre-Assessment: By the end of Grade 5, students understand that: • The faster a given object is moving, the more energy it possesses. • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. • Energy is present whenever there are moving objects, sound, light, or heat. • When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. • Light transfers energy from place to place. • Energy can be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by the transformation of energy of motion into electrical energy. • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. • When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. • An object can be seen when light reflected from its surface enters the eyes. • Digitized information can be transmitted over long	

distances without significant degradation. • High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
*Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. *Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. *Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	Emphasis is on describing waves with both qualitative and quantitative thinking. Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions. Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.	Develop and use models to describe the movement of waves in various materials. Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims that digitized signals are a more reliable way to encode and transmit information than analog signals are.	When light shines on an object, it is reflected, absorbed or transmitted through the object, depending on the object's material and the frequency (color) of the light. The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g. air and water, air and glass) where the light path bends. A wave model of light is useful for explaining brightness, color and the frequency-dependent bending of light at a surface between media. However, because light can travel through space, it cannot be a matter wave, like sound or water waves. Develop and use a model to describe that waves are reflected, absorbed or transmitted through various materials.	By the end of this unit, students will know: How electromagnetic radiation acts as a wave The different types of electromagnetic radiation that compose the electromagnetic spectrum The different interactions of radiation with matter, including reflection, absorption and refraction How we perceive different colors

Benchmark Assessment: A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. • Describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. • Graphs and charts can be used to identify patterns in data. • Waves can be described with both qualitative and quantitative thinking. When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. • The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. • A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. • Waves are reflected, absorbed, or transmitted through various materials. • A sound wave needs a medium through which it is transmitted. • Because light can travel through space, it cannot be a matter wave, like sound or water waves. • The structure of a wave can be modified to serve particular functions by taking into account properties of different materials and how materials can be shaped and used. Structures can be designed to use properties of waves to serve particular functions. • Waves can be used for communication purposes. • Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information than are analog signals. • Wave-related technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.	
Summative Written Assessments	
1. What is radiation? 2. How are light waves and mechanical waves different? 3. What is the relationship between wavelength, frequency and energy of electromagnetic radiation? 4. What are the different types of electromagnetic radiation? 5. What are the different types of reflection? 6. How does the absorption of light result in the different colors that we see? 7. How do objects refract through different mediums?	
Summative Performance Assessment	
By the end of this unit, students will be able to: Complete calculations based on wavelength, frequency and energy Differentiate between the different properties and uses of electromagnetic radiation Compare and contrast specular and diffuse reflection Explain how absorption results in changes in temperature of objects and different perceived colors Explain how refraction occurs and estimate angles of reflection and refraction	
https://njctl.org/courses/science/8th-grade-science/electromagnetic-radiation/attachments/electromagnetic-radiation-unit-plan/ http://www.state.nj.us/education/modelcurriculum/sci/8u7.pdf	

Unit Title: Stability and Change on Earth

Grade Level: 7th
Timeframe: 30 days

Essential Questions

Why aren't minerals and groundwater distributed evenly across the world?

1. What is climate and how does it compare to weather?
2. What are temperature anomalies and what does this mean in terms of climate?
3. What causes the climate and weather on Earth?
4. What is the difference between longwave and shortwave radiation and how do they impact the Earth's atmosphere?
5. What causes global climate change?
6. How does global climate change impact society?
7. How do scientists know what the past climate was like?
8. What are some technologies and behaviors that will help to reduce climate change?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

This unit is based on MS-ESS3-1, MS-ESS3-2, MS-ESS3-4, and MS-ESS3-5.

Highlighted Career Ready Practices:

- Knowing, using, and interpreting scientific explanations of the natural world (disciplinary core ideas and crosscutting concepts)
- Generating and evaluating scientific evidence and explanations (practices)
- Participating productively in scientific practices and discourse (practices)
- Understanding the nature and development of scientific knowledge (practices and crosscutting concepts)

Instructional Plan				Reflection
Pre-Assessment: By the end of Grade 5, students understand that: • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. • Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). • Humans cannot eliminate the hazards but can take steps to reduce their impacts. • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
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. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. Ask questions to clarify evidence of the factors that have caused the rise in	Emphasis is on how these resources are limited and typically nonrenewable, 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) Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable	Students who understand the concepts can: • Construct a scientific explanation based on valid and reliable evidence of how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geosciences processes. • Obtain evidence from sources, which must include the student's own experiments. • Construct a scientific explanation based on the assumption that theories and laws that describe the current geosciences process operates today as they did in the past and will continue to do so in the future.	Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century	By the end of this unit, students will know: The difference between climate and weather How to interpret graphs of long term climate data That the greenhouse effect is responsible for making our planet habitable How an enhanced greenhouse effect occurs That the greenhouse gases most influential to climate change and rising temperatures are caused by burning fossil fuels The difference between anthropogenic and natural causes of climate change That carbon dioxide is the greenhouse gas that humans emit the most of through electricity production and transportation The major impacts of global climate change How climate scientists obtain historical records of our atmosphere By the end of this unit, students will be able to: Identify examples of climate

global temperatures over the past century.	predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts). : 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,			versus weather Distinguish climate from weather using scenarios and graphs Describe what happens to incoming solar radiation once it reaches Earth's atmosphere? Identify greenhouse gases and their role in climate change Identify and describe anthropogenic sources of climate change Identify and describe natural sources of climate change Relate the cause and effects of climate change impacts. Describe the role of ice cores in climate science. Explain the function of the IPCC versus governmental policy makers. www.njctl.org 7th Grade PSI Global Climate Change The role of the Intergovernmental Panel on Climate Change (IPCC) in global climate change The difference between mitigation and adaptation strategies as they relate to climate change Technologies and behaviors that can be used or implemented to reduce the rate at which climate change is happening

	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 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.]			
Benchmark Assessment: Why aren't minerals and groundwater distributed evenly across the world? • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. • All human activities draw on Earth's land, ocean, atmosphere, and biosphere resources and have both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. • Minerals, fresh water, and biosphere resources are distributed unevenly around the planet as a result of past geologic processes. • Cause-and-effect relationships may be used to explain				

how uneven distributions of Earth's mineral, energy, and groundwater resources have resulted from past and current geosciences processes. • Resources that are unevenly distributed as a result of past processes include but are not limited to petroleum, metal ores, and soil. • Mineral, fresh water, ocean, biosphere, and atmosphere resources are limited, and many are not renewable or replaceable over human lifetimes. • The distribution of some of Earth's land, ocean, atmosphere, and biosphere resources are changing significantly due to removal by humans.

Summative Written Assessments

Questions the students will be able to answer as a result of the instruction
1. What is climate and how does it compare to weather? 2. What are temperature anomalies and what does this mean in terms of climate? 3. What causes the climate and weather on Earth? 4. What is the difference between longwave and shortwave radiation and how do they impact the Earth's atmosphere? 5. What causes global climate change? 6. How does global climate change impact society? 7. How do scientists know what the past climate was like? 8. What are some technologies and behaviors that will help to reduce climate change?

Summative Performance Assessment

By the end of this unit, students will be able to: Identify examples of climate versus weather, Distinguish climate from weather using scenarios and graphs, Describe what happens to incoming solar radiation once it reaches Earth's atmosphere? Identify greenhouse gases and their role in climate change Identify and describe anthropogenic sources of climate change, Identify and describe natural sources of climate change Relate the cause and effects of climate change impacts. Describe the role of ice cores in climate science. Explain the function of the IPCC versus governmental policy makers. www.njctl.org 7th Grade PSI Global Climate Change The role of the Intergovernmental Panel on Climate Change (IPCC) in global climate change The difference between mitigation and adaptation strategies as they relate to climate change Technologies and behaviors that can be used or implemented to reduce the rate at which climate change is happening Describe specific examples of mitigation and adaptation strategies in different governmental sectors (i.e. human health, ecosystems, etc.) in the face of climate change

https://njctl.org/courses/science/7th-grade-science/global-climate-change/

http://www.state.nj.us/education/modelcurriculum/sci/8u3.pdf

Unit Title: Organization for Matter and Energy Flow in Organisms

Grade Level: 7th
Timeframe: 15 days

Essential Questions

1. What is photosynthesis?
2. Why is photosynthesis important to all living things?
3. Where is the energy needed to perform photosynthesis created?
4. In what organisms does photosynthesis occur? In what cell structures does photosynthesis occur?
5. What is cellular respiration?
6. What materials are needed to perform photosynthesis? Cellular Respiration?
7. What materials are produced by photosynthesis? Cellular Respiration?
8. In what organisms does respiration occur? In what cell structures does respiration occur?
9. What is the relationship between Photosynthesis and Cellular Respiration?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
Science Standards: MS-LS1-6, MS-LS1-7

Highlighted Career Ready Practices:

Formulate research questions and develop a plan for research.
Use research to support and develop their own opinions.
Identify claims in their work that require outside support or validation

Instructional Plan	Reflection
Pre-Assessment: By the end of Grade 5, students understand that: • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. • The food of almost any kind of 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. • Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. • 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. • Matter cycles between the air and soil 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.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. **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.**	**Emphasis is on tracing movement of matter and flow of energy.** **Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.**	Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on valid and reliable evidence obtained from sources (including the students' own experiments). • Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • Develop and use a model to describe how food is rearranged through chemical reactions.	Plant, algae (including phytoplankton), and many microorganisms use energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6) Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth or to release energy. (MS-LS1-7) The chemical reactions by which plants produce complex food molecules (sugars) requires energy input (i.e., from sunlight) to occur. In this reaction carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (MS-LS1-7) http://www.nextgenscience.org/msls1-molecules-organisms-structuresprocesses Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Develop a model to describe how food is rearranged through chemical reactions to forming new molecules that support growth and/or release energy as this matter moves through an organism.	Photosynthesis uses carbon dioxide and water to store the energy of water in plants. It creates glucose and releases oxygen as a waste product. Photosynthesis gets its energy from the sun and occurs in the chloroplast of plants. Cellular respiration is the opposite of Photosynthesis. It releases the energy stored in glucose by combining it with oxygen to give off energy and releases carbon dioxide and water as waste products. This occurs in the mitochondria. These two cycles are a system that helps keep many organisms on Earth alive.

Benchmark Assessment:
What is the role of photosynthesis in the cycling of matter and flow of energy into and out of an organism?
How is food rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism?
Photosynthesis has a role in the cycling of matter and flow of energy into and out of organisms. • The flow of energy and cycling of matter can be traced. • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon based organic molecules and release oxygen. • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. • Sugars produced by plants can be used immediately or stored for growth or later use. • Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
Food is rearranged through chemical reactions, forming new molecules that support growth. • Food is rearranged through chemical reactions, forming new molecules that release energy as this matter moves through an organism. • Molecules are broken apart and put back together to form new substances, and in this process, energy is released. • Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy.

Summative Written Assessments

Questions the students will be able to answer as a result of the instruction:
1. What is photosynthesis?
2. Why is photosynthesis important to all living things?
3. Where is the energy needed to perform photosynthesis created?
4. In what organisms does photosynthesis occur? In what cell structures does photosynthesis occur?
5. What is cellular respiration?
6. What materials are needed to perform photosynthesis? Cellular Respiration?
7. What materials are produced by photosynthesis? Cellular Respiration?
8. In what organisms does respiration occur? In what cell structures does respiration occur?
9. What is the relationship between Photosynthesis and Cellular Respiration?

Summative Performance Assessment

By the end of this unit, students will be able to:
Model the processes of Photosynthesis and Cellular Respiration
Explain that the energy to power photosynthesis comes from the sun.
Construct a scientific explanation based on evidence for the role of photosynthesis in cycling matter and flow of energy in organisms.
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.
http://www.state.nj.us/education/modelcurriculum/sci/7u7.pdf
https://njctl.org/courses/science/7th-grade-science/matter-energy-in-everyday-life

Unit Title: Selection and Adaptation/
Inheritance & Variation of Traits (Natural Selection and Adaptation)
Grade Level: 7th
Timeframe: 20 Days

Essential Questions

What are natural selection and evolution?
How do species that pass on traits with genetic variation help the organisms survive and reproduce?
How do concepts of patterns, structure and function, help to describe biological evolution?
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):
This unit is based on MS-LS4-4, MS-LS4-5, and MS-LS4-6.

Highlighted Career Ready Practices:

Communicate Clearly and Effectively and with Reason.
Utilize Critical Thinking to Make Sense of Problems and Persevere in Solving Them,
Work Productively in Teams While Using Cultural Global Competence

Instructional Plan				Reflection
Pre-assessment:By the end of Grade 5, students understand that: • 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 how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. 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 simple probability statements and proportional reasoning to construct explanations : 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 Emphasis is on using mathematical models, probability statements, and proportional reasoning to support	Construct an explanation that includes probability statements regarding 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. 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	In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. 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. Based on their findings, students can write claims about how natural selection leads to a predominance of some traits in a population and the suppression of other traits.	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

	explanations of trends in changes to populations over time.	decreases of genetic traits in populations over		
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-andeffect 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.				
Summative Written Assessments				
What are natural selection and evolution? How do species that pass on traits with genetic variation help the organisms survive and reproduce? How do concepts of patterns, structure and function, help to describe biological evolution? 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?				
Summative Performance Assessment				
By the end of this unit, students will be able to: • SWBAT properly complete a Punnett Square and use it to predict the genes of offspring • SWBAT use an organism's genotype to describe the physical characteristics of the object • SWBAT properly perform test crosses to determine an unknown genotype • SWBAT demonstrate appropriate research skills and teach the class about birth defects and genetic mutations				

https://njctl.org/courses/science/7th-grade-science/inheritance-and-variation-of-traits/ http://www.state.nj.us/education/modelcurriculum/sci/8u2.pdf	

Unit Title: Human Impacts

Grade Level: 7th
Timeframe: 25 days

Essential Questions

1. What is a natural resource?
2. What makes a natural resource renewable? Non-renewable?
3. Where do natural resources come from?
4. How are natural resources used in society? What are some examples?
5. Why does the distribution of natural resources vary across the globe?
6. Is there a correlation between natural resource consumption and population growth?
7. Can a renewable resource ever be depleted?
8. What impacts do humans have on Earth's environment when we gather and use natural resources?
9. What is the relationship between ecological footprint per capita, human population growth, economic income and changes in biodiversity?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):
This unit is based on MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, and MS-ETS1-3.

Highlighted Career Ready Practices:

- Knowing, using, and interpreting scientific explanations of the natural world (disciplinary core ideas and crosscutting concepts)
- Generating and evaluating scientific evidence and explanations (practices)
- Participating productively in scientific practices and discourse (practices)
- Understanding the nature and development of scientific knowledge (practices and crosscutting concepts)

Instructional Plan				Reflection
Pre-Assessment: By the end of Grade 5, students understand that: When the environment changes in ways that affect a place's physical characteristics, temperature, or resource availability, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. Students also know that populations live in a variety of habitats, and change in those habitats affects the organisms living there. Human activities in agriculture, industry, and everyday life have major effects on land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. A simple design problem can be solved through the development of an object, tool, process, or system, and the solution can include several criteria for success and constraints on materials, time, or cost. Students know that they can test two different models of the same proposed object, tool, or process to determine which better meets criteria for success. Students also analyzed data to refine a problem statement or the design of a proposed object, tool, or process and used data to evaluate and refine design solutions. They applied scientific ideas to solve design problems and generate and compare multiple solutions to a problem based on how well they met the criteria and constraints of the design solution. Students have made claims about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	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	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1) Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MSESS3-3) Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS- ESS3-3),(MS-ESS3-4) http://www.nextgenscience.org/msess3-earth-human-activity	By the end of this unit, students will know: Sources of natural resources in terms of the atmosphere, lithosphere, hydrosphere and biosphere How humans use natural resources Specific examples of natural resources and their uses The distribution of natural resources on the planet varies due to different geological processes Changes in population affect natural resource consumption and Earth's environment. The major impacts on Earth's environment that

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	(such as of the air, water, or land).		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. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	occur due to natural resource consumption. How humans contribute to ecological footprint per capita The relationship between biodiversity, human population growth, ecological footprint per capita and economic income of a given population Why ecological overshoot is not sustainable in the long term The definition and requirement for sustainability Examples of sustainable actions that individual and society as a whole can take
Benchmark Assessment:: How do we monitor the health of the environment (our life support system)? • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. • Changes to Earth's environments can have different impacts (negative and positive) for different living things. • Typically as human populations and per capita consumption of natural resources increase, so do the negative impacts on Earth, unless the activities and technologies involved are engineered otherwise. • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.				

Summative Written Assessments	
Questions the students will be able to answer as a result of the instruction 1. What is a natural resource? 2. What makes a natural resource renewable? Non-renewable? 3. Where do natural resources come from? 4. How are natural resources used in society? What are some examples? 5. Why does the distribution of natural resources vary across the globe? 6. Is there a correlation between natural resource consumption and population growth? 7. Can a renewable resource ever be depleted? 8. What impacts do humans have on Earth's environment when we gather and use natural resources? 9. What is the relationship between ecological footprint per capita, human population growth, economic income and changes in biodiversity? www.njctl.org 7th Grade PSI Natural Resources and Human Impact 10. Why is an ecological overshoot harmful to the planet? 11. What does it mean to be sustainable? 12. What are some examples of sustainable activities and technologies? 13. How does sustainability benefit both people and the planet? 14. Is being sustainable an individual effort or a global effort? Why?	
Summative Performance Assessment	
By the end of this unit, students will be able to: Define natural resources Identify forms of natural resources and distinguish between each in terms of their source. Describe how natural resources play a role in society Explain how the distribution of various natural resources were shaped by past and current geological processes Describe how the population has changed in the last several decades and what impact this has on natural resource consumption and the Earth's environment. Identify and describe specific impacts of human natural resource consumption. Including land depletion through deforestation and agriculture, depletion of aquifers, pollution of land and air via mining, agriculture and burning of fossil fuels and global warming from deforestation and fossil fuel burning. Explain how the rate of change in ecological footprint is related to the rate of change in population growth and a country's economic income. Describe how the planet's biodiversity is linked to human population and ecological footprint per capita. Explain why long term ecological overshoot is detrimental to the planet and its inhabitants. Describe what actions people in a society can take to lessen ecological overshoot. Describe sustainable actions/technologies and identify how it benefits the planet http://www.state.nj.us/education/modelcurriculum/sci/8u4.pdf https://njctl.org/courses/science/7th-grade-science/natural-resources-and-human-impact/	

Unit Title: Evidence of Common Ancestry and Diversity

Grade Level: 7th
Timeframe: 15

Essential Questions

1. What are fossils and how are they created?
2. What is the geological timeline?
3. What evolution and what are the mechanisms for evolution?
4. How do anatomical similarities and differences help reconstruct evolutionary history?
5. What is embryological development and how does it support a common ancestry?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

This unit is based on MS-LS4-1, MS-LS4-2, and MS-LS4-3.

Highlighted Career Ready Practices:

Communicate Clearly and Effectively and with Reason.
Utilize Critical Thinking to Make Sense of Problems and Persevere in Solving Them,
Work Productively in Teams While Using Cultural Global Competence

Instructional Plan	Reflection
Pre-Assessment:By the end of Grade 5, students understand that: • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
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. 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. 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.	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. Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures. Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.	Use graphs, charts, and images to identify patterns within the fossil record. • Analyze and interpret data within the fossil record to determine similarities and differences in findings. • Make logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth. Apply scientific ideas to construct explanations for evolutionary relationships. • Apply the patterns in gross anatomical structures among modern organisms and between modern organisms and fossil organisms to construct explanations of evolutionary relationships. • Apply scientific ideas about evolutionary history to construct an explanation for evolutionary relationships evidenced by similarities or differences in the gross appearance of anatomical structures.	The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3) The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) Construct an explanation based on evidence for the placement of fossil in chronological order. Develop and use a model to describe the similarities and differences between various organisms. Develop and use a model to reconstruction of evolutionary history and the inference of lines of evolutionary descent. Analyze and interpret data on the embryological differences and similarities of different species not evident in fully-formed anatomy. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-oldhistory.	By the end of this unit, students will know: How fossils are creates, types of fossils and the transformational methods. How fossils are dated and what they reveal about Earth's history. How similarities and differences provide evidence for evolution How embryological differences provide clues not evident in fully formed anatomy
Benchmark Assessment:• The fossil record documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. • The collection of fossils and their placement in chronological order as identified through the location of sedimentary layers in which they are found or through radioactive dating is known as				

the fossil record. • Relative fossil dating is achieved by examining the fossil's relative position in sedimentary rock layers. • Objects and events in the fossil record occur in consistent patterns that are understandable through measurement and observation. • Patterns exist in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in rock layers. • Patterns can occur within one species of organism or across many species.Similarities and differences exist in the gross anatomical structures of modern organisms. • There are anatomical similarities and differences among modern organisms and between modern organisms and fossil organisms. • Similarities and differences exist in the gross anatomical structures of modern organisms and their fossil relatives. • Similarities and differences in the gross anatomical structures of modern organisms enable the reconstruction of evolutionary history and the inference of lines of evolutionary decent. • Patterns and anatomical similarities in the fossil record can be used to identify cause-and-effect relationships. • Science assumes that objects and events in evolutionary history occur in consistent patterns that are understandable through measurement and observation.	
Summative Written Assessments	
1. What are fossils and how are they created? 2. What is the geological timeline? 3. What evolution and what are the mechanisms for evolution? 4. How do anatomical similarities and differences help reconstruct evolutionary history? 5. What is embryological development and how does it support a common ancestry?	
Summative Performance Assessment	
By the end of this unit, students will be able to: Describe the different types of fossils and how they are formed. Explain the impact of fossils Describe the mechanisms for evolution Describe the theory of evolution and common ancestry	
https://njctl.org/courses/science/6th-grade-science/evidence-of-common-ancestry-and-diversity/ http://www.state.nj.us/education/modelcurriculum/sci/8u1.pdf	

Unit Title: Types of Interactions
Grade Level: 7th
Timeframe: 25 Days

Essential Questions

How are forces exerted over a distance?
What causes a a) gravitational field, b) electric field, and a c) magnetic field?
What are the three types of fields discussed in this unit?
How are they similar? How are they different?
What happens to the strength of a field as we move farther away from its source?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

This unit is based on MS-PS2-3, MS-PS2-4, and MS-PS2-5.

Highlighted Career Ready Practices:http://www.nj.gov/education/cte/hl/CRP.pdf

Use Technology to Enhance Productivity
Apply appropriate academic and technical skills
Communicate Clearly and Effectively and with Reason
Utilize Critical Thinking to Make Sense of Problems and Persevere in Solving Them

Instructional Plan				Reflection
By the end of Grade 5, students understand that: • Objects in contact exert forces on each other. • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center				
SLO	**Student Strategies**	**Formative Assessment**	**Activities and Resources**	**Reflection**
*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. *Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. *Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	*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 *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. * Examples of evidence for arguments could include data generated from simulations or digital tools; and charts	Students who understand the concepts are able to: • Students will conduct an investigation and evaluate an experimental design to produce data that can serve as the basis for evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. • Students will identify the cause-and-effect relationships between fields that exist between objects and the behavior of the objects.	*Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4) Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). (MS-PS2- 5) *Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. *Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.* *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.	By the end of this unit, students will be able to: Differentiate between the transfers of force via direct contact vs. fields. Explain that mass and distance of separation affect the magnitude of gravitational attraction. Diagram/explain charge distribution in positive and negative objects. Sketch/explain electric fields. Explain that charge strength and distance of separation affect the magnitude of electrical forces. www.njctl.org 8 th Grade PSI Types of interactions The interrelationships between electricity & magnetism. Diagram/explain the source of magnetism in terms of magnetic domains. Sketch/explain magnetic fields. Explain that magnetic strength

	displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.			and distance of separation affect the magnitude of magnetic forces. Identify the fact that moving electric charge produces magnetic fields and vice versa.
Benchmark Assessment: Fields exist between objects that exert forces on each other even though the objects are not in contact. • The interactions of magnets, electrically charged strips of tape, and electrically charged pith balls are examples of fields that exist between objects exerting forces on each other, even though the objects are not in contact. • Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object or a ball, respectively). • Cause-and-effect relationships may be used to predict phenomena in natural or designed systems. Factors affect the strength of electric and magnetic forces. • Devices that use electric and magnetic forces could include electromagnets, electric motors, and generators. • Electric and magnetic (electromagnetic) forces can be attractive or repulsive. • The size of an electric or magnetic (electromagnetic) force depends on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. • Cause-and-effect relationships may be used to predict the factors that affect the strength of electrical and magnetic forces in natural or designed systems				
Summative Written Assessments				
How are forces exerted over a distance? What causes a a) gravitational field, b) electric field, and a c) magnetic field? What are the three types of fields discussed in this unit? How are they similar? How are they different? What happens to the strength of a field as we move farther away from its source?				

Summative Performance Assessment	
By the end of this unit, students will be able to: Differentiate between the transfers of force via direct contact vs. fields. Explain that mass and distance of separation affect the magnitude of gravitational attraction. Diagram/explain charge distribution in positive and negative objects. Sketch/explain electric fields. Explain that charge strength and distance of separation affect the magnitude of electrical forces. www.njctl.org 8 th Grade PSI Types of interactions The interrelationships between electricity & magnetism. Diagram/explain the source of magnetism in terms of magnetic domains. Sketch/explain magnetic fields. Explain that magnetic strength and distance of separation affect the magnitude of magnetic forces. Identify the fact that moving electric charge produces magnetic fields and vice versa.	

Unit Title: Relationships among Forms of Energy/
Energy of Objects in Motion
Grade Level: 7th
Timeframe: 20 days

Essential Questions

What is work?
What types of energy make up mechanical energy?
How is mechanical energy transferred from one form to another?

Standards

Standards/Cumulative Progress Indicators (Taught and Assessed):

This unit is based on MS-PS3-1, MS-PS3-2, and MS-PS3-5.

Highlighted Career Ready Practices:http://www.nj.gov/education/cte/hl/CRP.pdf

Use Technology to Enhance Productivity
Apply appropriate academic and technical skills
Communicate Clearly and Effectively and with Reason
Utilize Critical Thinking to Make Sense of Problems and Persevere in Solving Them

Instructional Plan	Reflection
By the end of Grade 5, students understand that: • Energy is present whenever there are moving objects, sound, light, or heat. • When objects collide, energy can be transferred from one object to another, thereby changing the objects' motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. • Light also transfers energy from place to place. • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. • Transforming the energy of motion into electrical energy may have produced currents. • When objects collide, the contact forces the transfer of energy so as to change the objects' motions.	

SLO	Student Strategies	Formative Assessment	Activities and Resources	Reflection
*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. *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. *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.	*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. *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.]*Examples of	Construct and interpret graphical displays of data to identify linear and nonlinear relationships of kinetic energy to the mass of an object and to the speed of an object. Develop a model to describe what happens to the amount of potential energy stored in the system when the arrangement of objects interacting at a distance changes • Use models to represent systems and their interactions, such as inputs, processes, and outputs, and energy and matter flows within systems. Models could include representations, diagrams, pictures, and written descriptions.	Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1) A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3 2) When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) 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. Develop a model to describe that when the arrangements of objects interacting at a distance changes, different amounts of potential energy are stored in the system.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.	By the end of this unit, students will know: The difference between mechanical and nonMechanical energy. The variables that kinetic energy depend upon. The variables that gravitational potential energy depend upon. The variables that elastic potential energy depend upon. The Law of Conservation of Energy states that energy can be transferred from one type to another, but cannot be created or destroyed. The difference between renewable and nonrenewable energy sources. How different types of energy resources convert mechanical energy into electrical energy.

	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			
Benchmark Assessment: When the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. • A system of objects may contain stored (potential) energy, depending on the objects' relative positions. • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the objects. • Models that could include representations, diagrams, pictures, and written descriptions of systems can be used to represent systems and their interactions, such as inputs, processes, and outputs, and energy and matter flows within systems.				
Summative Written Assessments				
What is work? What types of energy make up mechanical energy? How is mechanical energy transferred from one form to another?				
Summative Performance Assessment				
By the end of this unit, students will be able to: Calculate when work is done on a system. Calculate kinetic energy. Calculate gravitational potential energy. Calculate elastic potential energy. Demonstrate understanding of mechanical energy transfer via diagrams.				