MS - ESS3 - Earth and Human Activity

NGSS:

Students who demonstrate understanding can:

[MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
[Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable 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 tornadoprone regions or reservoirs to mitigate droughts).]

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*
[Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

Eastampton Township School District
Curriculum Guide
Grade: 6
Content Area: Earth & Space Science

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

Big Ideas:

ESS3.A: Natural Resources

- *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)***

ESS3.B: Natural Hazards

- *Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.**(MS-ESS3-2)***

ESS3.C: Human Impacts on Earth Systems

- *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. **(MS-ESS3-3)***
- *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.**(MSESS3-3),(MS-ESS3-4)***

ESS3.D: Global Climate Change

- *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. **(MS-ESS3-5)***

Eastampton Township School District
Curriculum Guide
Grade: 6
Content Area: Earth & Space Science

Performance Expectations

Science and Engineering Practices | **Disciplinary Core Ideas** | **Crosscutting Concepts**

Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

Ask questions to identify and clarify evidence of an argument. ***(MS-ESS3-5)***

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Analyze and interpret data to determine similarities and differences in findings. ***(MS-ESS3-2)***

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by

ESS3.A: Natural Resources

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)***

ESS3.B: Natural Hazards

Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. ***(MS ESS3-2)***

ESS3.C: Human Impacts on Earth Systems

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. ***(MS-ESS3-3)***

Patterns

Graphs, charts, and images can be used to identify patterns in data. ***(MS ESS3-2)***

Cause and Effect

Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. ***(MS-ESS3-3)***

Cause and effect relationships may be used to predict phenomena in natural or designed systems. ***(MS-ESS3- 1),(MS-ESS3-4)***

Stability and Change

Stability might be disturbed either by sudden events or gradual changes that accumulate over time. ***(MS-ESS3-5)***

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

	multiple sources of evidence consistent with scientific ideas, principles, and theories.	*Typically as human populations and per-capita consumption of natural resources increase, so do the negative*	*All human activity draws on natural resources and has both short and long term consequences, positive as well as negative, for the health of people and the natural environment.* ***(MS-ESS3-***	

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and 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. ***(MS ESS3-1)***

Apply scientific principles to design an object, tool, process or system. ***(MS ESS3-3)***

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. ***(MS-ESS3-4)***

impacts on Earth unless the activities and technologies involved are engineered otherwise. ***(MSESS3- 3),(MS-ESS3-4)***

ESS3.D: Global Climate Change

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. ***(MS-ESS3-5)***

1),(MS-ESS3-4)

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. ***(MS-ESS3- 2),(MSESS3-3)***

---- ---- Connections to Nature of Science

Science Addresses Questions About the Natural and Material World

Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. ***(MS-ESS3-4)***

The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.

Essential Questions:	Enduring Understandings:
● What causes weather and climate? ● What cycles and processes shape the surface of the Earth? ● What causes earthquakes and volcanic eruptions? ● What natural processes break down rocks and shape earth's surface? ● How does Earth's atmosphere affect life on Earth?	● Water circulates through Earth's crust, oceans, and atmosphere in the water cycle. ● Weather and climate are the result of the interactions among Earth's water, its atmosphere and the Sun's heating of Earth's surface. ● Factors like temperature and pressure influence changes in the weather, causing regional variations.

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- interpret local weather data that has been collected and changes that have occurred over time.
- use several pieces of evidence (cloud observations, weather maps) to identify causes of change in weather and weather patterns (for example: weather systems generally move from west to east in the UnitedStates).
- relate changes in local weather to larger scale weather patterns (for example: the general motion of regional air masses) ● explain how Earth's surface features (mountains, oceans) affect localweather.
- use data tables, graphs, maps, satellite images, etc. to compare weather conditions in various locations and over time ● explain the difference between weather and climate.
- identify the factors affecting climate change overtime.
- locate and map the distribution of various minerals, energy and groundwater globally.
- connect distribution of natural resources with past and current geological processes.
- construct their own forecast for the potential of a natural hazard event to affect an area in the future by analyzing patterns in data. ● assess how human population growth affects natural resource consumption.
- assess how natural resource consumption has an effect on Earth systems, changes in human populations have a causal role in changing Earth systems.

Understandings

1. Huge quantities of energy are always acting on the surface of the Earth and its interior.
2. Observable evidence in the present gives information about processes and events that occurred in the past. 3. The Sun is the major source of energy for theEarth.

4. Weather and climate are the result of the interactions among Earth's water, its atmosphere and the Sun's heatingof Earth's surface.

Instructional Materials/Resources:

***Materials include, but are not limited to:**

- Science Binders / Engineering Notebook
- index cards
- various recycled materials for prototyping
- safety goggles
- non-latex gloves
- magnifying glasses
- measuring tools
    - o ruler
    - o yard stick
    - o meter stick
    - o tape measures
    - o stopwatch
    - o architect scale
    - o thermometer
- Construction material
    - o paper
    - o scissors
    - o glue
    - o tape
    - o markers
    - o crayons

Suggested Vocabulary

- climate
- weather
- coriolis effect
- el niño
- la niña
- earthquake
- epicenter
- cinder cone volcano
- composite volcano
- shield volcano
- magma
- igneous rock
- regional climate
- seismic waves
- subduction zone
- ring of fire
- oceanic-continental convergence
- richter scale
- atmosphere
- hydrosphere
- geosphere
- biosphere
- thermosphere

- o staplers
- o holepunch

- Chemistry lab equipment
  - o beakers
  - o flasks
  - o graduated cylinders
  - o pippett
  - o Etc.

- Demonstration materials
  - o marbles
  - o rubber bands
  - o non-latex balloons
  - o bowling ball
  - o feathers
  - o flashlights
  - o batteries
  - o

- mesosphere
- stratosphere
- troposphere
- high pressure
- low pressure
- high tide
- low tide
- climate change
- greenhouse gas
- natural resources
- fossil fuels
- hydrocarbons

Technology:

- Active board
- Ipads
- Computers
- Internet access

- Plant materials
  - o seeds
  - o soil
  - o peat moss
  - o UV Light
  - o containers
  - o planters
  - o shovel
  - o prepared and blank
- **Book(s):** *"Environmental Science"* Prentice Hall, *"Weather and Climate"* Prentice Hall, *"Astronomy"* Prentice Hall, *"The Nature of Science and Technology"* Prentice Hall

Recommended Instructional Activities:

The below link will take you to the NGSS website where you can find numerous lessons/activities that correspond to the standards. http://ngss.nsta.org/classroom-resources-results.aspx?CoreIdea=1

- **Human Activity & Climate Change:** In this activity students will examine graphs of GHG (Greenhouse Gas) emissions and their increases associated with human activity. Students will calculate their own personal contributions to CO_2 emissions.
  - https://www.ucar.edu/learn/1_4_2_20t.htm

- Calculate your carbon footprint and see what you use on a daily basis and how it impacts the environment and world we live in.
  - http://www.nature.org/greenliving/carboncalculator/?matchtype=b&creative=33211791470&device=c&network=g&src=sea.AWG.PR0.CP131.AD159.KW1124.MT1.BU132&gclid=CPP2yZOiqMICF Ud efgodg04Ar

Extension Strategies/Activities:

- **Reduce Environmental Impacts** - design ways to reduce environmental impacts due to human use of resources. Become a better saver on utilities and waste less. Replenish earth's water supply with desalination plants. Games and fun for students, resources for teachers - http://www.getwise.org/

- **Human Impact on Earth's Systems** - Various resources on human impact on Earth's Systems -

Modification Strategies/Activities:
- Review
- Reinforce
- Reteach
- Enrich
- Performance Assessment

Writing
- Graphic Organizers
- Word Bank

- Extra Time
- Study Guide

http://lincoln8science.weebly.com/human-impact-of-earth systems.html

- **Earth Science week** - Classroom activities categorized byNGSS http://www.earthsciweek.org/classroom-activities/ngss
- **NGSS Lesson Resources** - http://www.lascifair.org/wp content/uploads/2012/09/NGSS-Lesson-resources-Maben.pdf

Eastampton Township School District
Curriculum Guide
Grade: 6
Content Area: Earth & Space Science

- **Lesson Plans Exploring NGSS** - http://www.resa.net/curriculum/curriculum/science/professionald evel opment/ngss-pd/lesson-plans-exploring-ngss/

Grade Level Curriculum Outlines:

6th Grade

DNA & Heredity

- Invention of the Microscope
- Cell Organelles
- Cellular Respiration
- Traits
- Cloning
- Genetic Diseases

Electricity & Magnetism

- Magnetism
- Magnetic Earth
- SImple Circuits
- Electrical Safety
- Electromagnetism

Inside Earth

- Layers of the Earth
- Plate Tectonics
- Earthquakes
- Sea-floor Spreading

Sound & Light

- Electromagnetic Spectrum
- Sight & Hearing
- Solar
- Reflection & Refraction
- Opaque, Translucent, & Transparent

8th Grade

Environmental Science

- Populations and Communities
- Ecosystems and Biomes
- Living Resources
- Land, Water, and Air Resources
- Energy Resources

Chemical Interactions

- Atoms and Bonding
- Chemical Reactions
- Acids, Bases,and Solutions
- Carbon Chemistry

Astronomy

- Earth, Moon, and Sun
- Exploring Space
- The Solar System
- Stars, Galaxies, and the Universe

Weather and Climate

- The Atmosphere
- Weather Factors
- Weather Patterns
- Climate and Climate Change

Cross-curricular Connections/Standards:

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2),(MS ESS3-4),(MS-ESS3-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2)

WHST.6-8.1 Write arguments focused on discipline content. (MS-ESS3-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)

WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-ESS3-3)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.

(MS-ESS3-1),(MS-ESS3-4) Mathematics –

MP.2 Reason abstractly and quantitatively. (MS-ESS3-2),(MS-ESS3-5)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS ESS3-3),(MS-ESS3-4)

7.RP.A.2 Recognize and represent proportional relationships between quantities.(MS-ESS3-3),(MS-ESS3-4)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5)

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5

Technology
8.1.5.A.2
8.1.5.A.4
8.1.5.A.5

21st Century Life and Careers
9.2.8.B.1
CRP1
CRP2

)

Suggested Assessments:

- Tests & quizzes
- Current Science Assignments
- Classwork on various topics
- Homework Assignments
- Differentiated Projects
- Teacher observations
- Discussion/Class participation
- Lab Reports

Modifications for SpEd/ESL/Students at Risk/Gifted

Supports, Accommodations, and Modifications must be provided as stated in IEP, 504 Plan or I-Team Intervention Plan, and may include (but not limited to) the following:

Presentation accommodations:

· Listen to audio recordings instead of reading text
· Learn content from audio books, movies, videos and digital media instead of reading print versions
· Use alternate texts at lower readability level
· Work with fewer items per page or line and /or materials in a larger print size
· Use magnification device, screen reader, or Braille/Nemeth Code
· Use audio amplification device (e.g., hearing aide(s), auditory trainer, sound-field system(which may require teacher use of microphone) · Be given a written lists of instructions
· Record a lesson, instead of taking notes
· Have another student share class notes with him
· Be given an outline of lesson
· Be given a copy of teacher's lecture notes
· Be given a study guide to assist in preparing for assessments
· Use visual presentations of verbal material, such as word webs and visual organizers
· Use manipulatives to teach or demonstrate concepts
· Have curriculum materials translated into native language

Response accommodations:

· Use sign language, a communication device, Braille, other technology, or native language other than English · Dictate answers to a scribe
· Capture responses to an audio recorder
· Use a spelling dictionary or electronic spell-checker
· Use a word processor to type notes or give responses in class
· Use a calculator or table or "math facts"
· Respond directly in the test booklet rather than on an answer sheet.

Setting accommodations:

· Work or take a test in a different setting, such as quiet room with few distractions
· Sit where he learns best (for example, near the teacher, away from distractions)

· Use special lighting or acoustics
· Take a test in small group setting

· Use sensory tools such as an exercise band that can be looped around a chair's legs (so fidgety kids can kick it and quietly get their energy out)

· Use noise buffers such as headphones, earphones, or earplugs

Timing accommodations:

· Take more time to complete a task or a test
· Have extra time to process oral information and directions
· Take frequent breaks, such as after completing a task

Scheduling accommodations:

· Take more time to complete a project
· Take a test in several timed sessions or over several days
· Take sections of a test in a different order
· Take a test at a specific time of day

Organization skills accommodations:

· Use an alarm to help with time management
· Mark texts with a highlighter
· Have help coordinating assignments in a book or planner
· Receive study skills instruction

Assignment modifications:

· Complete fewer or different homework problems than peers
· Write shorter paper
· Answer fewer or different test questions
· Create alternate projects or assignments

Curriculum modifications:

· Get graded or assessed using a different standard than the one for classmates

MS-LS3 - Heredity: Inheritance & Variation of Traits

NGSS:

Students who demonstrate understanding can:

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
[Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
[Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

Big Ideas:

LS1.B: Growth and Development of Organisms

- *Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to **MSLS3-2)***

LS3.A: Inheritance of Traits

- *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 affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. **(MS-LS3-1)***
- *Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. **(MS-LS3-2)***

LS3.B: Variation of Traits

- *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.**(MS-LS3-2)***

● *In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.**(MS-LS3-1)***
Performance Expectations

	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	

Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. *Develop and use a model to describe phenomena.* ***(MS-LS3-1),(MS-LS3-2)***	**LS1.B: Growth and Development of Organisms** *Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.* ***(secondary to MSLS3-2)*** **LS3.A: Inheritance of Traits** *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 affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.* ***(MS-LS3-1)*** *Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.* ***(MS-LS3-2)*** **LS3.B: Variation of Traits**	**Cause and Effect** *Cause and effect relationships may be used to predict phenomena in natural systems.* ***(MS-LS3- 2)*** **Structure and Function** *Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.* ***(MS-LS3- 1)***	

		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. ***(MS-LS3-2)*** *In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.* ***(MS-LS3-1)***	
The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.			

Essential Questions:

- How are traits passed down from parents to their children?
- How can genotype determine phenotype?
- How do gametes differ from somatic cells?
- How does meiosis differ from mitosis?
- How did Mendel's work differ from other scientists trying to understand how traits are inherited?
- Why do children have some traits that cannot be found in either parent?
- How have human technological advances increased our knowledge of genetics and influence on inheritance?

Enduring Understandings:

- All life is based on the same genetic code.
- The instructions for forming species' characteristics are carried in DNA.
- DNA determines traits and traits are inherited.
- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA.
- Reproduction is essential to the continuation of a species.
- Multiple genetic and/or environmental factors often play a role in the expression of a trait.

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- apply how meiosis is an early step in reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
- analyze how random chromosome segregation explains the probability that a particular allele will be in a gamete. ● predict possible combinations of alleles in a zygote from the genetic makeup of the parents.
- . predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant orrecessive).
- assess how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
- Students know why proteins having different amino acid sequences typically have different shapes and chemical properties. ● create models of general structures and functions ofDNA.
- justify how to apply base-pairing rules that make up DNA.
- assess how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

Understandings

1. Mutation and reproduction lead to genetic variation in a population.
2. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.
3. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism
4. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.

Instructional Materials/Resources:

****Materials include, but are not limited to:**

- Science Binders / EngineeringNotebook
- index cards
- various recycled materials for prototyping
- safety goggles
- non-latex gloves
- magnifying glasses
- measuring tools
    - o ruler
    - o yard stick
    - o meter stick
    - o tape measures
    - o stopwatch
    - o architect scale
    - o thermometer
- Construction material
    - o paper
    - o scissors
    - o glue
    - o tape
    - o markers
    - o crayons
    - o staplers
    - o holepunch
- Chemistry lab equipment

Suggested Vocabulary

- genetics
- heredity
- genotype
- phenotype
- allele
- diploid
- dominant
- recessive
- gamete
- genetic recombination
- haploid
- heterozygous
- homozygous
- homologous chromosome
- hybrid
- law of independent assortment
- law of segregation
- meiosis
- nondisjunction
- pollination
- reproduction
- trait

Technology:

- o beakers
- o flasks
- Active board
- Ipads
- Computers

Eastampton Township School District

Curriculum Guide
Grade: 6, 7
Content Area: Life Science

- Internet access
- o graduated cylinders
- o pippett
- o Etc.
- Demonstrationmaterials
  - o marbles
  - o rubber bands
  - o non-latex balloons
  - o bowling ball
  - o feathers
  - o flashlights
  - o batteries
  - o
- Plant materials
  - o seeds
  - o soil
  - o peat moss
  - o UV Light
  - o containers
  - o planters
  - o shovel
  - o prepared and blank
- **Book(s):** *"From Bacteria to Plants"* Prentice Hall, *"Cells and Heredity"* Prentice Hall, Text *"Human Biology and Health"* Prentice Hall,

Recommended Instructional Activities:

The below link will take you to the NGSS website where you can find numerous lessons/activities that correspond to the standards. http://ngss.nsta.org/classroom-resources-results.aspx?CoreIdea=1

- **MS-LS3-1** Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. ○ http://ngss.nsta.org/Resource.aspx?ResourceID=136
  - ○ http://ngss.nsta.org/Resource.aspx?ResourceID=148

- **MS-LS3-2** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
  - ○ http://ngss.nsta.org/Resource.aspx?ResourceID=127
  - ○ http://ngss.nsta.org/Resource.aspx?ResourceID=160
  - ○ http://ngss.nsta.org/Resource.aspx?ResourceID=431

Extension Strategies/Activities:

- **Genetics -** resources, animations, interactive simulations

Modification Strategies/Activities: ●

Review
- Reinforce

Eastampton Township School District
Curriculum Guide
Grade: 6, 7
Content Area: Life Science

http://learngenetics.com/

● **Biodiversity -** Biodiversity; classification; evolution resources

http://eol.org/ ● **Dragon Genetics -** an interactive simulation that allows you to change the alleles of dragons and witness the phenotype changes. You have

https://www.google.com/accounts/AddSession?service=wise&continue=htt ps://docs.google.com/document/d/1Sl8wiao1GYd8UfXYF7p0eJTc1GF8dXvRzxW2aICTVw/edit to complete a certain number of steps before it allows you to move on. This is good, students cannot click quickly through it.

http://biologica.concord.org/webtest1/web_labs_genophenotype.htm

● **Genetic Engineer -** Students become the "pilots" for engineering organisms to become more resistant to predation, herbicides, and pesticides. http://agbiosafety.unl.edu/education/whowants.htm

● **GMO's -** This would be a great place to introduce the topic of GMOs. http://www.pbs.org/pov/foodinc/lesson-plan-3/

● **Earth Science week** - Classroom activities categorized byNGSS http://www.earthsciweek.org/classroom-activities/ngss

● **NGSS Lesson Resources** - http://www.lascifair.org/wp-content/uploads/2012/09/NGSS-Lesson-resources-Maben.pdf

● **Lesson Plans Exploring NGSS** - http://www.resa.net/curriculum/curriculum/science/professionaldevel opment/ngss-pd/lesson-plans-exploring-ngss/

- Reteach
- Enrich
- Performance Assessment

Writing ● Graphic Organizers

- Word Bank
- Extra Time
- Study Guide

Grade Level Curriculum Outlines:

6th Grade

DNA & Heredity

- Invention of the Microscope
- Cell Organelles
- Cellular Respiration
- Traits
- Cloning
- Genetic Diseases

Electricity & Magnetism

- Magnetism
- Magnetic Earth
- SImple Circuits
- Electrical Safety
- Electromagnetism

Inside Earth

- Layers of the Earth
- Plate Tectonics
- Earthquakes
- Sea-floor Spreading

Sound & Light

- Electromagnetic Spectrum
- Sight & Hearing
- Solar
- Reflection & Refraction
- Opaque, TRanslucent, & Transparent

7th Grade

Chemical Building Blocks

- Introduction to Matter
- Solids, Liquids, and Gases
- Elements and the Periodic Table
- Exploring Materials

From Bacteria to Plants

- Living Things
- Viruses and Bacteria
- Protists and Fungi
- Introduction to Plants
- Seed Plants

Human Biology and Health

- Bones, Muscles, and Skin
- Food and Digestion
- Circulation

- Respiratory and Excretion
- Fighting Disease
- The Nervous System
- The Endocrine System

Motion, Forces, and Energy

- Motion
- Forces
- Forces in Fluids
- Work and Machines
- Energy
- Thermal Energy and Heat

Eastampton Township School District
Curriculum Guide
Grade: 6, 7
Content Area: Life Science

Cross-curricular Connections/Standards:

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1),(MS-LS3-2)

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (MS-LS3-1),(MS-LS3-2)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1),(MS-LS3-2)

SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-LS3-1),(MS-LS3-2)

Mathematics –

MP.4 Model with mathematics. (MS-LS3-2)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)

Technology
8.1.5.A.2
8.1.5.A.4
8.1.5.A.5

21st Century Life and Careers
9.2.8.B.1
CRP1
CRP2

Suggested Assessments:

- Tests & quizzes
- Current Science Assignments
- Classwork on various topics

- Homework Assignments
- Differentiated Projects

Modifications for SpEd/ESL/Students at Risk/Gifted

Supports, Accommodations, and Modifications must be provided as stated in IEP, 504 Plan or I-Team Intervention Plan, and may include (but not limited to) the following:

Presentation accommodations:

· Listen to audio recordings instead of reading text
· Learn content from audio books, movies, videos and digital media instead of reading print versions
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· Work with fewer items per page or line and /or materials in a larger print size
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· Have another student share class notes with him
· Be given an outline of lesson
· Be given a copy of teacher's lecture notes
· Be given a study guide to assist in preparing for assessments
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· Use a calculator or table or "math facts"
· Respond directly in the test booklet rather than on an answer sheet.

Setting accommodations:

· Work or take a test in a different setting, such as quiet room with few distractions
· Sit where he learns best (for example, near the teacher, away from distractions)
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· Take a test in small group setting
· Use sensory tools such as an exercise band that can be looped around a chair's legs (so fidgety kids can kick it and quietly get their energy out)
· Use noise buffers such as headphones, earphones, or earplugs

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· Take more time to complete a task or a test
· Have extra time to process oral information and directions

· Take frequent breaks, such as after completing a task

Scheduling accommodations:

· Take more time to complete a project
· Take a test in several timed sessions or over several days
· Take sections of a test in a different order
· Take a test at a specific time of day

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· Mark texts with a highlighter
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Assignment modifications:

· Complete fewer or different homework problems than peers
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· Create alternate projects or assignments

Curriculum modifications:

· Get graded or assessed using a different standard than the one for classmates

- Teacher observations
- Discussion/Class participation
- Lab Reports

Eastampton Township School District
Curriculum Guide
Grade: 6, 7
Content Area: Life Science

MS-LS4 - Biological Evolution: Unity and Diversity

BOE Approved August 2022

NGSS:

Students who demonstrate understanding can:

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
[Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
[Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
[Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
[Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

Big Ideas:

LS4.A: Evidence of Common Ancestry and Diversity

- 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 relationshipsnot evident in the fully-formed anatomy. **(MS-LS4-3)**

LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. **(MS-LS4- 4)**
- 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 onto offspring. **(MS LS4-5)**

LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. **(MS-LS4-6)**

Performance Expectations

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

	Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. *Analyze displays of data to identify*	**LS4.A: Evidence of Common Ancestry and Diversity** *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)***	**Patterns** *Patterns can be used to identify cause and effect relationships.* ***(MS-LS4-2)*** *Graphs, charts, and images can be used to identify patterns in data.* ***(MS LS4-1),(MS-LS4-3)*** **Cause and Effect** *Phenomena may have more than one*

linear and nonlinear relationships. ***(MS-LS4-3)***

Analyze and interpret data to determine similarities and differences in findings. ***(MS-LS4-1)***

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

Use mathematical representations to support scientific conclusions and design solutions. ***(MS LS4-6)***

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. ***(MS-LS4-2)***

Construct an explanation that

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)

LS4.B: Natural Selection

Natural selection leads to the predominance of certain traits in a population, and the suppression of others.

(MS-LS4-4)

In artificial selection, humans have the capacity to influence certain characteristics of organisms by

cause, and some cause and effect relationships in systems can only be described using probability.

(MS-LS4-4),(MS-LS4-5),(MS-LS4-6)

---- Connections to Engineering,Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. ***(MS-LS4-5)***

--- Connections to Nature of Science

Scientific Knowledge Assumes

	includes qualitative or quantitative relationships between variables	*selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.* ***(MS-LS4-5)*** **LS4.C: Adaptation** *Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more*	an Order and Consistency in Natural Systems *Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.* ***(MS LS4-1),(MS-LS4-2)*** Science Addresses Questions About the Natural and Material World *Scientific knowledge can describe the consequences of actions but does not*
	that describe phenomena. ***(MS-LS4-4)***	*common; those that do not become less common. Thus, the distribution of traits in a population changes.* ***(MS-LS4-6)***	*necessarily prescribe the decisions that society takes.* ***(MS LS4-5)***

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. ***(MS-LS4-5)***

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

Science knowledge is based upon logical and conceptual connections between evidence and explanations. ***(MS-LS4-1)***

The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.

Essential Questions:	Enduring Understandings:
● What factors cause adaptations in organisms? ● How did Charles Darwin formulate his theory of evolution? ● Why do some organisms go extinct while others survive? ● How does the process of natural selection influence evolution?	● All living things are made up of cells. ● In organisms, cells work together to form tissues and organs that are specialized for particular body functions. ● Each sense receptor responds to different inputs, transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- 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 evolutionaryrelationships.
- 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.
- Construct an explanation based on evidence that describes how genetic variations of traits in a populationincrease some individuals' probability of surviving and reproducing in a specificenvironment. ● 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 increasesand decreases of specific traits in populations over time.

Understandings

1. Fossils provide evidence about the types of organisms (both visible and microscopic) that lived long ago and also about the nature of their environments.

2. Fossils can be compared with one another and to living organisms according to their similarities and differences. 3. Genetic variation in a species results in individuals with a range of traits.

4. When there are environmental changes, there is a natural selection for individuals with particular traits so those individuals are more likely to survive and reproduce.

5. The process of natural selection results over time in a predominance of certain inherited traits in apopulation. 6. Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.

7. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

8. Populations of organisms live in a variety of habitats, and change in those habitats affects the organisms livingthere. Humans, like all other organisms, obtain living and nonliving resources from theirenvironments.

Instructional Materials/Resources:

****Materials include, but are not limited to:**

- Science Binders / Engineering Notebook
- index cards
- various recycled materials for prototyping
- safety goggles
- non-latex gloves
- magnifying glasses
- measuring tools
    - ruler
    - yard stick
    - meter stick
    - tape measures
    - stopwatch
    - architect scale
    - thermometer
- Construction material
    - paper
    - scissors
    - glue
    - tape
    - markers
    - crayons

Suggested Vocabulary

- Biological evolution
- unity and the diversity of species
- unifying principle(s)
- diversity of life on Earth
- scientific evidence
- fossil record
- genetic relationships among species
- DNA and protein sequence analyses
- evolutionary relationships
- Evolution
- natural selection
- genetic variation
- population
- distribution of traits
- extinction
- environmental challenges
- emergence of new species
- similarities of genetic material across all species
- biodiversity
- natural resources
- ecological services
- sustainability

- o staplers
- o holepunch

- Chemistry lab equipment
  - o beakers
  - o flasks
  - o graduated cylinders
  - o pippett
  - o Etc.
- Demonstration materials
  - o marbles
  - o rubber bands
  - o non-latex balloons
  - o bowling ball
  - o feathers
  - o flashlights
  - o batteries
  - o
- Plant materials
  - o seeds
  - o soil
  - o peat moss
  - o UV Light
  - o containers
  - o planters
  - o shovel
  - o prepared and blank
- **Book(s):** *"From Bacteria to Plants"* Prentice Hall, *"Cells and Heredity"* Prentice Hall, Text *"Human Biology and Health"* Prentice Hall

Technology:

- Active board
- Ipads
- Computers
- Internet access

Recommended Instructional Activities:

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- **MS-LS4-1** Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
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- **MS-LS4-4** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. ○ http://ngss.nsta.org/Resource.aspx?ResourceID=55
- **MS-LS4-5** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
  - http://ngss.nsta.org/Resource.aspx?ResourceID=126

Extension Strategies/Activities:

- **HHMI BioInteractive -** many real-life examples of evolution in the short films section, as well as good history of the theory. http://www.hhmi.org/biointeractive
- **Understanding Evolution -** lots of good teacher resources, background information, and rebuttals for difficult parents http://evolution.berkeley.edu/
- **Stated Clearly -** short video animations that explain What is Evolution, What is Natural Selection, Evidence for

Modification Strategies/Activities:

- Review
- Reinforce
- Reteach
- Enrich
- Performance Assessment Writing
- Graphic Organizers
- Word Bank
- Extra Time
- Study Guide

Evolution http://statedclearly.com/

- **Examining the Fossil Record -** found at BiologyCorner.com to download a fossil record activity.
- **Earth Science week** - Classroom activities categorized byNGSS http://www.earthsciweek.org/classroom-activities/ngss
- **NGSS Lesson Resources** - http://www.lascifair.org/wp content/uploads/2012/09/NGSS-Lesson-resources-Maben.pdf
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Motion, Forces, and Energy

- Motion
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- Work and Machines
- Energy

- Thermal Energy and Heat

Cross-curricular Connections/Standards:

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1),(MSLS4-2),(MS-LS4-3),(MS-LS4-4),(MS-LS4-5)

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1),(MS-LS4-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3),(MS-LS4-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2),(MS-LS4-4)

WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-LS4-5)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2),(MS-LS4-4)

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4- 2),(MS-LS4-4)

Mathematics –

MP.4 Model with mathematics. (MS-LS4-6)

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6)

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2)

Curriculum Guide

Grade: 6, 7
Content Area: Life Science

7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6)

Technology
8.1.5.A.2
8.1.5.A.4
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21st Century Life and Careers
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Assignment modifications:

· Complete fewer or different homework problems than peers
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· Create alternate projects or assignments

Curriculum modifications:

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· Get graded or assessed using a different standard than the one for classmates

Eastampton Township School District
Curriculum Guide
Grade: 6, 7
Content Area: Physical Science

MS-PS2 Motion and Stability: Forces and Interactions

NGSS:

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
[Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
[Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

[Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence

Big Ideas:

- Newton's 3rd Law describes the forces exerted by two interacting objects.
- The motion of an object depends on the forces acting on it and the mass of the object.

- Gravity always pulls and changes based on the masses of the objectsinvolved.
- Kinetic energy is the energy of motion and depends on the speed and mass of theobject.
- Potential energy is stored energy and depends on the position of the object.

PS2.A: Forces and Motion

- 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 arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. **(MSPS2-2)**

PS2.B: Types of Interactions

- 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, 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).**(MS-PS2-5)**

Performance Expectations

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

	Asking Questions and Defining Problems Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. *Ask questions that can be investigated within the scope of the classroom,*	**PS2.A: Forces and Motion** *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,*	**Cause and Effect** *Cause and effect relationships may be used to predict phenomena in natural or designed systems.* **(MS-PS2-3),(MS PS2-5)** **Systems and System Models** *Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.* **(MS-PS2-1),(MS-PS2-4)**	

outdoor environment, and museums and other public facilities with available resources and, when appropriate,frame a hypothesis based on observations and scientific principles. **(MS-PS2-3)**

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. **(MS-PS2-2)**

Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. **(MS-PS2-5)**

Constructing Explanations and Designing Solutions

Constructing explanations and

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 arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. ***(MSPS2- 2)***

PS2.B: Types of Interactions

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, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a

Stability and Change

Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. **(MS-PS2-2)**

Connections to Engineering,Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

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. ***(MS-PS2-1)***

	designing solutions in 6–8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent	*charged object, or a ball, respectively).* **(MS PS2-5)**		

with scientific ideas, principles, and theories.

Apply scientific ideas or principles to design an object, tool, process or system. **(MS-PS2-1)**

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.

Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
(MS-PS2-4)

---- ---- ***Connections to Nature of Science***

Scientific Knowledge is Based on Empirical Evidence

Science knowledge is based upon logical and conceptual connections between evidence and explanations.
(MS-PS2-2),(MS-PS2-4)

The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.

Essential Questions:	Enduring Understandings:
● Determine the forces acting on an object and use the information to describe the motion and changes in motion of the object. ● Describe gravity and its influence on objects. ● Define kinetic energy and calculate the total kinetic energy of an object. ● List the forms of potential energy. ● Explain how potential energy of an object can change based on the object's position. ● What is the purpose of using a simple or compoundmachine? ● What is the difference between a simple and compoundmachine? ● If energy cannot be created or destroyed, why do we need to be concerned about our energy sources? ● What is the relationship between potential energy and kinetic energy? ● How do subsystems interact to create a system? ● Why is the design process used when creating new products?	● Matter is everywhere and everything; it cannot be created or destroyed, even on the molecular level.

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- Identify the six simple machines: the lever, pulley, wheel and axle, inclined plane, wedge, and screw.
- Identify a machine as something that helps use energy more efficiently.
- Describe work as the force applied over a distance.
- Explain the applications of the six simplemachines.
- Distinguish between the three classes of levers.
- Determine mechanical advantage from assembled simplemachines.
- Compare and contrast kinetic and potential energy.
- Predict the relative kinetic energy based on the mass and speed of the object.
- Recognize and demonstrate safety rules for using lab tools andmachines.
- Build, test, and evaluate a model of a design problem.
- Analyze a product through testing methods and make modifications to the product.

Understandings

1. Simple machines can make work easier by increasing mechanicaladvantage.
2. Mechanical advantage is the ratio of the force produced by a machine to the force applied to themachine.
3. Compound machines are made from a combination of several simplemachines.
4. Energy cannot be created or destroyed but may be transferred into different types ofenergy.
5. Humans use their energy, along with simple machines, to do work by changing the state of energy of an object from potential to kinetic.
6. Prototyping is an important step in the design process and provides the designer with a scaled working model that can be used for testing.

Instructional Materials/Resources:

****Materials include, but are not limited to:**

- Science Binders / Engineering Notebook
- index cards
- various recycled materials for prototyping
- safety goggles
- non-latex gloves
- magnifying glasses
- measuring tools
    - ruler
    - yard stick
    - meter stick
    - tape measures
    - stopwatch
    - architect scale
    - thermometer
- Construction material
    - paper
    - scissors
    - glue
    - tape
    - markers
    - crayons

Suggested Vocabulary

- force
- net force
- balanced forces
- unbalanced forces
- newton
- gravity
- meter
- friction
- motion
- velocity
- speed
- slope
- acceleration
- inertia
- friction
- potential Energy
- kinetic Energy
- point of Reference
- theory of plate tectonics
- International System of units
- Isaac Newton
- free fall
- momentum

● pressure

- staplers
- holepunch

- Chemistry lab equipment
  - beakers
  - flasks
  - graduated cylinders
  - pippett
  - Etc.
- Demonstration materials
  - marbles
  - rubber bands
  - non-latex balloons
  - bowling ball
  - feathers
  - flashlights
  - batteries
  -
- Plant materials
  - seeds
  - soil
  - peat moss
  - UV Light
  - containers
  - planters
  - shovel
  - prepared and blank
- **Book:** "Motion, Forces, and Energy" Prentice Hall Science Explorer "Sound and Light" Prentice Hall Science Explorer, "Electricity & Magnetism" Prentice Hall

Technology:

- Active board
- Ipads
- Computers
- Internet access

Recommended Instructional Activities:

The below link will take you to the NGSS website where you can find numerous lessons/activities that correspond to the standards.
http://ngss.nsta.org/classroom-resources-results.aspx?CoreIdea=1

- **MS-PS2-1.** Apply Newton's Third Law to design a solution to a problem involving the motion of two collidingobjects.* ● **MS-PS2-2.** Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object
- **MS-PS2-5.** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- Inspector Detector Challenge http://ngss.nsta.org/Resource.aspx?ResourceID=246 (MS-PS2-5)

Extension Strategies/Activities:

"Your Weight on other Worlds"

- Students enter a weight on Earth, and view the equivalent weight on other planets, Pluto, Earth's moon, some of Jupiter's moons, and a few types of stars. The calculator/model is followed by a reading about the differences between mass and weight, and the relationship between gravity, mass, and distance.
- http://ngss.nsta.org/Resource.aspx?ResourceID=103
- http://www.exploratorium.edu/ronh/weight/ (MS-PS2-4)

"Floating static Balls"

- The resource describes five short activities involving static electricity attraction and repulsion, then offers suggestions for students to alter activities by changing one suggested variable at a time, in order to design and try their own investigation. A "How Does it Work?" section summarizes the nano scale explanation for static attraction and repulsion
- http://ngss.nsta.org/Resource.aspx?ResourceID=319
- http://www.stevespanglerscience.com/lab/experiments/floating static-bands (MS-PS2-5)

"Science of NHL Hockey: Newton's Three Laws of Motion"

- This resource pairs an educational video that examines Newton's 3 Laws of Motion in the sport of hockey with a lab activity exploring the three laws. In the lab activity, students are encouraged to design their own experiments and/or demonstrations about the Laws of Motion, through a suggested student demonstration is also provided for each law.

Modification Strategies/Activities: ●

Review

- Reinforce
- Reteach
- Enrich
- Performance Assessment Writing
- Graphic Organizers
- Word Bank
- Extra Time
- Study Guide

- http://www.nbclearn.com/nhl/cuecard/56615
  - The link opens a small window. To find the lesson plan click the "Lesson" tab to the right of the video.
- http://ngss.nsta.org/Resource.aspx?ResourceID=320 (MS-PS2-2)

Grade Level Curriculum Outlines:

6th Grade

DNA & Heredity

- Invention of the Microscope
- Cell Organelles
- Cellular Respiration

- Traits
- Cloning
- Genetic Diseases

Electricity & Magnetism

- Magnetism
- Magnetic Earth
- SImple Circuits
- Electrical Safety
- Electromagnetism

Inside Earth

- Layers of the Earth
- Plate Tectonics
- Earthquakes
- Sea-floor Spreading

Sound & Light

- Electromagnetic Spectrum
- Sight & Hearing
- Solar
- Reflection & Refraction
- Opaque, Translucent, & Transparent

7th Grade

Chemical Building Blocks

- Introduction to Matter
- Solids, Liquids, and Gases
- Elements and the Periodic Table
- Exploring Materials

From Bacteria to Plants

- Living Things
- Viruses and Bacteria
- Protists and Fungi
- Introduction to Plants

- Seed Plants

Human Biology and Health

- Bones, Muscles, and Skin
- Food and Digestion
- Circulation
- Respiratory and Excretion
- Fighting Disease
- The Nervous System
- The Endocrine System

Motion, Forces, and Energy

- Motion
- Forces
- Forces in Fluids
- Work and Machines
- Energy
- Thermal Energy and Heat

Cross-curricular Connections/Standards:

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attendingto the precise details of explanations or descriptions. *(MS-PS2-1),(MS-PS2-3)*

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, takingmeasurements, or performing technical tasks. *(MS-PS2-1),(MS-PS2-2),(MS-PS2-5)*

WHST.6-8.1 Write arguments focused on *discipline-specific content*. (MS-PS2-4)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. *(MS-PS2-1)*,(MS-PS2-2),*(MS-PS2-5)*

Mathematics -

MP.2 Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3)

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. *(MS-PS2-1),(MS-PS2- 2)*

7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.*(MS-PS2-1),(MS-PS2-2)*

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
(MS- PS2-1),(MS-PS2-2)

Technology
8.1.5.A.2
8.1.5.A.4
8.1.5.A.5

21st Century Life and Careers
9.2.8.B.1
CRP1
CRP2

Suggested Assessments:

- Tests & quizzes
- Current Science Assignments
- Classwork on various topics
- Homework Assignments
- Differentiated Projects
- Teacher observations
- Discussion/Class participation
- Lab Reports

Modifications for SpEd/ESL/Students at Risk/Gifted

Supports, Accommodations, and Modifications must be provided as stated in IEP, 504 Plan or I-Team Intervention Plan, and may include (but not limited to) the following:

Presentation accommodations:

· Listen to audio recordings instead of reading text
· Learn content from audio books, movies, videos and digital media instead of reading print versions
· Use alternate texts at lower readability level
· Work with fewer items per page or line and /or materials in a larger print size
· Use magnification device, screen reader, or Braille/Nemeth Code
· Use audio amplification device (e.g., hearing aide(s), auditory trainer, sound-field system(which may require teacher use of microphone) · Be given a written lists of instructions
· Record a lesson, instead of taking notes
· Have another student share class notes with him
· Be given an outline of lesson
· Be given a copy of teacher's lecture notes
· Be given a study guide to assist in preparing for assessments
· Use visual presentations of verbal material, such as word webs and visual organizers
· Use manipulatives to teach or demonstrate concepts
· Have curriculum materials translated into native language

Response accommodations:

· Use sign language, a communication device, Braille, other technology, or native language other than English · Dictate answers to a scribe
· Capture responses to an audio recorder
· Use a spelling dictionary or electronic spell-checker
· Use a word processor to type notes or give responses in class
· Use a calculator or table or “math facts”
· Respond directly in the test booklet rather than on an answer sheet.

Setting accommodations:

· Work or take a test in a different setting, such as quiet room with few distractions
· Sit where he learns best (for example, near the teacher, away from distractions)
· Use special lighting or acoustics
· Take a test in small group setting
· Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)
· Use noise buffers such as headphones, earphones, or earplugs

Timing accommodations:

· Take more time to complete a task or a test
· Have extra time to process oral information and directions
· Take frequent breaks, such as after completing a task

Scheduling accommodations:

· Take more time to complete a project
· Take a test in several timed sessions or over several days
· Take sections of a test in a different order
· Take a test at a specific time of day

Organization skills accommodations:

· Use an alarm to help with time management
· Mark texts with a highlighter
· Have help coordinating assignments in a book or planner
· Receive study skills instruction

Assignment modifications:

· Complete fewer or different homework problems than peers
· Write shorter paper
· Answer fewer or different test questions
· Create alternate projects or assignments

Curriculum modifications:

· Get graded or assessed using a different standard than the one for classmates

Eastampton Township School District
Curriculum Guide
Grade: 6, 7
Content Area: Physical Science

Eastampton Township School District
Curriculum Guide
Grade: 6, 7
Content Area: Physical Science

MS-PS4-Waves and Their Application in Technologies for Information Transfer

NGSS:

MS-PS4-1. 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.
[Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
[Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]

MS-PS4-3. 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.
[Clarification Statement: 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.] [Assessment Boundary: Assessment does not include binarycounting. Assessment does not include the specific mechanism of any given device.]

Big Ideas:

PS4.A: Wave Properties

● A simple wavehas a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) ● A sound wave needs a medium through which it is transmitted. (MS-PS4-2)

PS4.B: Electromagnetic Radiation

- 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. (MS-PS4-2)
- 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. (MS-PS4-2)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2)
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)

PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.(MS-PS4-3)

Performance Expectations		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using,and revising models to describe, test, and predict more abstract phenomena and design systems. *Develop and use a model to describe phenomena.* ***(MS-PS4-2)*** **Using Mathematics and Computational Thinking** Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. *Use mathematical representations to describe and/or support scientific conclusions and design solutions.* ***(MS-PS4-1)*** **Obtaining, Evaluating, and Communicating Information**	**PS4.A: Wave Properties** *A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.* ***(MS-PS4-1)*** *A sound wave needs a medium through which it is transmitted.* ***(MS PS4-2)*** **PS4.B: Electromagnetic Radiation** *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.* ***(MS PS4-2)*** *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.* ***(MS-PS4-2)*** *A wave model of light is useful for*	**Patterns** *Graphs and charts can be used to identify patterns in data. (MS-PS4-1)* **Structure and Function** *Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.* **(MS-PS4-2)** *Structures can be designed to serve particular functions.* ***(MS-PS4-3)*** --- **Connections to Engineering, Technology, and Applications of Science** **Influence of Science, Engineering, and Technology on Society and the Natural World** *Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.* ***(MS-PS4-3)*** --- *Connections to Nature of Science Science is a Human Endeavor Advances in technology influence the progress of science and science has influenced advances in technology.* ***(MS-PS4-3)***	

Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods. *Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.* ***(MS-PS4-3)*** --- ---- ---- **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** *Science knowledge is based upon logical and conceptual connections between evidence and explanations.* ***(MS-PS4-1)***	*explaining brightness, color,and the frequency-dependent bending of light at a surface between media.* ***(MS-PS4-2)*** *However, because light can travel through space, it cannot be a matter wave, like sound or water waves.* ***(MS-PS4-2)*** **PS4.C: Information Technologies and Instrumentation** *Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.* ***(MS-PS4-3)***	

The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.

Essential Questions:	Enduring Understandings:
● How are waves used to transfer energy and information? ● What are the characteristic properties and behaviors of waves? ● Describe two types of waves and how they can be represented. ● Explain how a wave's speed is related to its wavelength and frequency.	● Basic properties of waves (wavelength, amplitude, and patterns of motion). ● We can see objects because light reflects off of them and into our eyes. ● Patterns can be transferred through waves to send information. ● Develop multiple solutions to problems and evaluate their efficiency. ● Waves carry energy and move through matter.

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- identify the characteristics of a simple mathematical wave model of a phenomenon, including:
  - Waves represent repeating quantities.
  - Frequency, as the number of times the pattern repeats in a given amount of time (e.g., beats per second).
  - Amplitude, as the maximum extent of the repeating quantity from equilibrium (e.g., heightor depth of a water wave from average sea level).
  - Wavelength, as a certain distance in which the quantity repeats its value (e.g., the distance between the tops of a series of water waves).
- Analyze a product through testing methods and make modifications to the product.
- Use their simple mathematical wave models to identify patterns, including:
  - That the energy of the wave is proportional to the square of the amplitude (e.g., if the height of a water wave is doubled, each wave will have four times the energy).
  - That the amount of energy transferred by waves in a given time is proportional to frequency (e.g., if twice as many water waves hit the shore each minute, then twice as much energy will be transferred to the shore).

Understandings

- Basic properties of waves (wavelength, amplitude, and patterns ofmotion).

- We can see objects because light reflects off of them and into our eyes.
- Patterns can be transferred through waves to send information.
- Develop multiple solutions to problems and evaluate their efficiency.
- Waves carry energy and move through matter.

Instructional Materials/Resources:

****Materials include, but are not limited to:**

- Science Binders / Engineering Notebook
- index cards
- various recycled materials for prototyping
- safety goggles
- non-latex gloves
- magnifying glasses
- measuring tools
    - o ruler
    - o yard stick
    - o meter stick
    - o tape measures
    - o stopwatch
    - o architect scale
    - o thermometer
- Construction material
    - o paper
    - o scissors
    - o glue
    - o tape
    - o markers
    - o crayons

Suggested Vocabulary

- Waves
- Amplitude
- Frequency
- Reflect
- Absorb
- Transmit
- Medium
- Encode
- Transparent
- Pulse
- Wavelength
- Digitized signal
- Analog signal
- Mechanical waves
- Refraction

- staplers
- holepunch

- Chemistry lab equipment
  - beakers

- flasks
- graduated cylinders
- pippett
- Etc.

- Demonstration materials

Technology:

- Active board
- Ipads
- Computers
- Internet access

- marbles
- rubber bands
- non-latex balloons
- bowling ball
- feathers
- flashlights
- batteries
-

- Plant materials
  - seeds
  - soil
  - peat moss
  - UV Light
  - containers
  - planters
  - shovel
  - prepared and blank
- **Book(s):** "Sound and Light" Prentice Hall Science Explorer
  "Electricity and Magnetism" Prentice Hall Science Explorer

Recommended Instructional Activities:

- MS-PS4-1. 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.
- MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- MS-PS4-3. 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.
- Students develop a model to make sense of a given phenomenon. In the model, students identify the relevant components, including:
  - Type of wave.
    - Matter waves (e.g., sound or water waves) and their amplitudes andfrequencies.
    - Light, including brightness (amplitude) and color(frequency).
  - Various materials through which the waves are reflected, absorbed, ortransmitted.
  - Relevant characteristics of the wave after it has interacted with a material (e.g.,frequency, amplitude, wavelength).
  - Position of the source of the wave

Extension Strategies/Activities:

"Catch a wave: How waves are formed"

- http://fyi.uwex.edu/wi4hstem/files/2015/03/Catch-a-Wave.pdf

Surf's up … but why? Although many young people think that waves originate from inside the water, the water doesn't actually move with the waves. Instead, waves are formed by "wind friction," i.e., wind energy moving across the water's surface. In this lesson, youth take part in a series of activities to see how waves are formed and why some waves are bigger than others. So put on the surfing tunes and get ready to catch some waves!

"Making Music with Glass"

- Students will be creating a water glass xylophone to examine differences in waves.
- http://www.ccsoh.us/Downloads/7PS3B_Making%20Waves.pdf

"Coat Hanger Chimes Activity"

- http://www.ccsoh.us/Downloads/7PS3B_Making%20Waves.pdf
- Using nothing more than a coat hanger and some string you will explore and understand sound energy and how it moves.

Modification Strategies/Activities:

- Review
- Reinforce
- Reteach
- Enrich
- Performance Assessment Writing
- Graphic Organizers
- Word Bank
- Extra Time
- Study Guide
- Post vocabulary around the room

Grade Level Curriculum Outlines:
6th Grade

DNA & Heredity

- Invention of the Microscope
- Cell Organelles
- Cellular Respiration
- Traits
- Cloning
- Genetic Diseases

Electricity & Magnetism

- Magnetism
- Magnetic Earth
- SImple Circuits
- Electrical Safety
- Electromagnetism

Inside Earth

- Layers of the Earth
- Plate Tectonics
- Earthquakes

- Sea-floor Spreading

Sound & Light

- Electromagnetic Spectrum
- Sight & Hearing
- Solar
- Reflection & Refraction
- Opaque, Translucent, & Transparent

7th Grade

Chemical Building Blocks

- Introduction to Matter

- Solids, Liquids, and Gases
- Elements and the Periodic Table
- Exploring Materials

From Bacteria to Plants

- Living Things
- Viruses and Bacteria
- Protists and Fungi
- Introduction to Plants
- Seed Plants

Human Biology and Health

- Bones, Muscles, and Skin
- Food and Digestion
- Circulation
- Respiratory and Excretion
- Fighting Disease
- The Nervous System
- The Endocrine System

Motion, Forces, and Energy

- Motion
- Forces
- Forces in Fluids
- Work and Machines
- Energy

- Thermal Energy and Heat

Cross-curricular Connections/Standards:

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 - Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)

RST.6-8.2 - Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3)

RST.6-8.9 - Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)

WHST.6-8.9 - Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)

SL.8.5 - Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2)

Mathematics -

MP.2 - Reason abstractly and quantitatively. (MS-PS4-1)

MP.4 - Model with mathematics. (MS-PS4-1)

6.RP.A.1 - Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)

6.RP.A.3 - Use ratio and rate reasoning to solve real-world and mathematical problems.

(MS-PS4-1) 7.RP.A.2 - Recognize and represent proportional relationships between quantities.

(MS-PS4-1)

8.F.A.3 - Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)

Technology *8.1.5.A.2*; *8.1.5.A.4*; *8.1.5.A.5*

21st Century Life and Careers 9.2.8.B.1; CRP1; CRP2

Suggested Assessments:

- Tests & quizzes
- Current Science Assignments
- Classwork on various topics
- Homework Assignments
- Differentiated Projects
- Teacher observations
- Discussion/Class participation
- Lab Reports

Modifications for SpEd/ESL/Students at Risk/Gifted

Supports, Accommodations, and Modifications must be provided as stated in IEP, 504 Plan or I-Team Intervention Plan, and may include (but not limited to) the following:

Presentation accommodations:

· Listen to audio recordings instead of reading text

· Learn content from audio books, movies, videos and digital media instead of reading print versions

· Use alternate texts at lower readability level

· Work with fewer items per page or line and /or materials in a larger print size

· Use magnification device, screen reader, or Braille/Nemeth Code

· Use audio amplification device (e.g., hearing aide(s), auditory trainer, sound-field system(which may require teacher use of microphone) · Be given a written lists of instructions

· Record a lesson, instead of taking notes
· Have another student share class notes with him
· Be given an outline of lesson
· Be given a copy of teacher's lecture notes
· Be given a study guide to assist in preparing for assessments
· Use visual presentations of verbal material, such as word webs and visual organizers
· Use manipulatives to teach or demonstrate concepts
· Have curriculum materials translated into native language

Response accommodations:

· Use sign language, a communication device, Braille, other technology, or native language other than English ·
Dictate answers to a scribe
· Capture responses to an audio recorder
· Use a spelling dictionary or electronic spell-checker
· Use a word processor to type notes or give responses in class
· Use a calculator or table or "math facts"
· Respond directly in the test booklet rather than on an answer sheet.

Setting accommodations:

· Work or take a test in a different setting, such as quiet room with few distractions
· Sit where he learns best (for example, near the teacher, away from distractions)
· Use special lighting or acoustics
· Take a test in small group setting
· Use sensory tools such as an exercise band that can be looped around a chair's legs (so fidgety kids can kick it and quietly get their energy out)
· Use noise buffers such as headphones, earphones, or earplugs

Timing accommodations:

· Take more time to complete a task or a test
· Have extra time to process oral information and directions
· Take frequent breaks, such as after completing a task

Scheduling accommodations:

· Take more time to complete a project
· Take a test in several timed sessions or over several days
· Take sections of a test in a different order
· Take a test at a specific time of day

Organization skills accommodations:

· Use an alarm to help with time management
· Mark texts with a highlighter

· Have help coordinating assignments in a book or planner
· Receive study skills instruction

Assignment modifications:

· Complete fewer or different homework problems than peers

· Write shorter paper
· Answer fewer or different test questions

· Create alternate projects or assignments

Curriculum modifications:

· Get graded or assessed using a different standard than the one for classmates

Content Area: Earth & Space Science

MS - ESS1 - Earth's Place in the Universe

NGSS:

Students who demonstrate understanding can:

MS-ESS1-1. 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.
[Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
[Clarification Statement: 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. 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).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.
[Clarification Statement: 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.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]

MS-ESS1-4. 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-old history.
[Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]

Big Ideas:

ESS1.A: The Universe and Its Stars

- *Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.* ***(MS-ESS1-1)***
- *Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.* ***(MS-ESS1- 2)***

ESS1.B: Earth and the Solar System

- *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.****(MS-ESS1-2),(MSESS1-3)***
- *This 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.****(MS-ESS1-1)***
- *The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.****(MS-ESS1-2)***

ESS1.C: The History of Planet Earth

- *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)***

Performance Expectations

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. *Develop and use a model to describe phenomena.* ***(MS-ESS1-1),(MS-ESS1- 2)***	**ESS1.A: The Universe and Its Stars** *Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.* ***(MS-ESS1-1)*** *Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.* ***(MS ESS1-2)***	**Patterns** *Patterns can be used to identify cause - and-effect relationships.* ***(MS-ESS1-1)*** *Graphs, charts, and images can be used to identify patterns in data.* ***(MS LS4-1),(MS-LS4-3)*** **Scale, Proportion, and Quantity** *Time, space, and energy phenomena*

Eastampton Township School District

Curriculum Guide
Grade: 6, 8
Content Area: Earth & Space Science

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Analyze and interpret data to determine similarities and differences in findings. ***(MS-ESS1-3)***

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6– 8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and 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. ***(MS ESS1- 4)***

ESS1.B: Earth and the Solar System

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. ***(MS-ESS1-2),(MSESS1-3)***

This 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. ***(MS-ESS1-1)***

The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. ***(MS-ESS1- 2)***

ESS1.C: The History of Planet Earth

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)***

can be observed at various scales using models to study systems that are too large or too small. ***(MS-ESS1-3),(MS ESS1-4)***

Systems and System Models

Models can be used to represent systems and their interactions. ***(MS ESS1-2)***

Connections to Engineering,Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. ***(MSESS1-3)***

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and

			observation. ***(MS ESS1-1),(MS-ESS1-2)***	

	The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.	

Essential Questions:

- How does Earth's place in the universe affect life on Earth? ● What is the role of gravity in the motions of objects in ourSolar System?
- How does Earth's moon affect tides on Earth?
- How would our lives be different if the Earth was not tilted on its axis?
- Why are scale models important when studying space?

Enduring Understandings:

- Scientific inquiry involves asking scientifically-oriented questions, collecting evidence, forming explanations, connecting explanations to scientific knowledge and theory, and communicating and justifying explanations.
- Minerals, rocks, and soils are formed by processes that occur above and within Earth's crust.
- The Earth's surface features The Earth's surface has changed dramatically over time, and changes continue to occur. Changes in the Earth's surface are caused by natural processes such as erosion, deposition and plate tectonics.
- The Earth is billions of years old. Fossils provide evidence that life existed at least 3.5 billion years ago, and that living things have changed over time.
- Describe the main components of the Solar System and explain how the Sun, Moon, and Earth interact to

cause day, year, seasons, phases of the Moon and eclipses.

● A model of something is similar to, but not exactly like, the thing being modeled. Some models are physically similar to what they are representing, but others are not.

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- explain why fossils are more likely to occur in sedimentary rocks e Describes how fossil evidence can be linked to environmental conditions and biological adaptations of the past.
- describe the parts and motions of the Solar System (Sun, planets, moons, asteroids, comets).
- compare and contrast the characteristics of the Sun, Moon and Earth.
- examine and explain the scientific theories on the formation of our Solar System, Earth, and Moon. ● distinguish objects in the Solar System from those outside it e Sequences pictures of phases of the Moon and explain why the Moon appears to change shape.
- draw a sketch that shows the position of the Sun, Earth, and Moon to explain the new and fullmoons. ● explains solar and lunar eclipses.
- create and utilize a model to:
    - demonstrate how the Earth rotates with respect to the Sun resulting in day and night.
    - demonstrate how the tilt and orbit of Earth result in seasons.
    - demonstrate how the Earth orbits the Sun resulting in a year.
- explain how gravity affects the movement of the Sun, Moon and Earth.
- compare and contrast the internal and external characteristics of planets.
- create a model of the relative size of planets, given a scale to use.

- show the relative distances between planets, given a scale to use.
- evaluate several ways that Earth differs from the other planets.
- explain the destination, purposes, challenges and history of spaceexploration.
- describe the components of the universe in terms of galaxies, stars and solarsystems.

Understandings

1. Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted 2. Seasonal patterns of sunrise and sunset can be observed, described, and predicted
3. There are different patterns of sunrise and sunset in the four different seasons throughout the year.

Instructional Materials/Resources:

***Materials include, but are not limited to:**

- Science Binders / Engineering Notebook
- index cards
- various recycled materials for prototyping
- safety goggles
- non-latex gloves
- magnifying glasses
- measuring tools
    - o ruler
    - o yard stick
    - o meter stick
    - o tape measures
    - o stopwatch
    - o architect scale
    - o thermometer

Suggested Vocabulary

- Planetary System
- Asteroid
- Meteoroid
- Comet
- Astronomical unit
- Rotation
- Axis
- Revolution
- Orbit
- Ellipse
- season
- Axial tilt
- Phases
- First quarter
- Third quarter
- Gravity
- Eclipse

- Construction material
    - paper
    - scissors
    - glue
    - tape
    - markers
    - crayons
    - staplers
    - holepunch
- Chemistry lab equipment

Technology:

- Active board
- Ipads
- Computers
- Internet access