

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 **MS-LS3-2**)*

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
<p>Developing and Using Models</p> <p>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.</p> <p><i>Develop and use a model to describe phenomena. (MS-LS3-1), (MS-LS3-2)</i></p>	<p>LS1.B: Growth and Development of Organisms</p> <p><i>Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)</i></p> <p>LS3.A: Inheritance of Traits</p> <p><i>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)</i></p> <p><i>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)</i></p>	<p>Cause and Effect</p> <p><i>Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)</i></p> <p>Structure and Function</p> <p><i>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)</i></p>

LS3.B: Variation of Traits

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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

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

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of genetics and influence on inheritance? 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 or recessive).
- 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 of DNA.
- 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.

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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 / 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
 - staplers
 - 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

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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,

● 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-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

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<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>

<https://docs.google.com/document/d/1SI8wiao1GYd>

[8UfXYF7p0eJTc1GF8dXvRzxW2aICTVw/edit](https://www.google.com/accounts/AddSession?service=wise&continue) 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 by NGSS <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/professionaldlevelopment/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

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- 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

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- 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

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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

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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
- 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:

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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

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

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- Teacher observations
- Discussion/Class participation
- Lab Reports

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MS-LS4 - Biological Evolution: Unity and Diversity

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.]

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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 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 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

<p>Analyzing and Interpreting Data</p> <p>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.</p> <p>Analyze displays of data to identify</p>	<p>LS4.A: Evidence of Common Ancestry and Diversity</p> <p>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)</p> <p>Patterns</p> <p>Patterns can be used to identify cause and effect relationships. (MS-LS4-2)</p> <p>Graphs, charts, and images can be used to identify patterns in data. (MS LS4-1),(MS-LS4-3)</p> <p>Cause and Effect</p> <p>Phenomena may have more than one</p>
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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

<p>includes qualitative or quantitative relationships between variables</p>	<p>selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.</p> <p>(MS-LS4-5)</p> <p>LS4.C: Adaptation</p> <p>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</p>	<p>an Order and Consistency in Natural Systems</p> <p>Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.</p> <p>(MS LS4-1),(MS-LS4-2)</p> <p>Science Addresses Questions About the Natural and Material World</p> <p>Scientific knowledge can describe the consequences of actions but does not</p>
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<p>that describe phenomena.</p> <p>(MS-LS4-4)</p>	<p>common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)</p>	<p>necessarily prescribe the decisions that society takes.</p> <p>(MS LS4-5)</p>
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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:

- 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?

Enduring Understandings:

- 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

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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 evolutionary relationships.
- Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
- Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

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.

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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 a population.
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 living there. Humans, like all other organisms, obtain living and nonliving resources from their environments.

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

Technology:

- o staplers
- o holepunch
- Chemistry lab equipment
 - o beakers
 - o flasks

- Active board
- Ipads
- Computers

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- o graduated cylinders
- o pipett
- 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

- Internet access

- **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-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.
 - <http://ngss.nsta.org/Resource.aspx?ResourceID=56>
- **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>

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Grade: 6, 7

Content Area: Life Science

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>
- **Lesson Plans Exploring NGSS** - <http://www.resa.net/curriculum/curriculum/science/professionald>

<http://www.resa.net/curriculum/curriculum/science/professionald>

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

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Curriculum Guide

Grade: 6, 7

Content Area: Life Science

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

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Content Area: Life Science

- 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),(MS-LS4-2),(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)

7.RPA.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

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

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Content Area: Life Science

- 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:

- Learn different material (such as continuing to work on multiplication while classmates move on to fractions, or moving ahead to an extension concept/skill while classmates continue to work on a core skill)
- Get graded or assessed using a different standard than the one for classmates

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.

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- Gravity always pulls and changes based on the masses of the objects involved.
- Kinetic energy is the energy of motion and depends on the speed and mass of the object.
- 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. **(MS-PS2-2)**

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

<p>Asking Questions and Defining Problems</p> <p>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.</p> <p><i>Ask questions that can be investigated within the scope of the classroom,</i></p>	<p>PS2.A: Forces and Motion</p> <p><i>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)</i></p> <p><i>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,</i></p>	<p>Cause and Effect</p> <p><i>Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS PS2-5)</i></p> <p>Systems and System Models</p> <p><i>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)</i></p>
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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. (MS-PS2-2)

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	<i>charged object, or a ball, respectively).</i> (MS PS2-5)		
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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:

- Determine the forces acting on an object and use the information to

Enduring Understandings:

- Matter is everywhere and everything; it cannot be created or destroyed, even on the molecular level.

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Content Area: Physical Science

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 compound machine? ●
- What is the difference between a simple and compound machine?
- 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?

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 simple machines.
- Distinguish between the three classes of levers.
- Determine mechanical advantage from assembled simple machines.
- 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 and machines.
- Build, test, and evaluate a model of a design problem.
- Analyze a product through testing methods and make modifications to the product.

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Understandings

1. Simple machines can make work easier by increasing mechanical advantage.
2. Mechanical advantage is the ratio of the force produced by a machine to the force applied to the machine.
3. Compound machines are made from a combination of several simple machines.
4. Energy cannot be created or destroyed but may be transferred into different types of energy.
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

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Technology:

- 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: "Motion, Forces, and Energy" Prentice Hall Science Explorer "Sound and Light" Prentice Hall Science Explorer, "Electricity & Magnetism" Prentice Hall
- 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 colliding objects.*
- **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

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Grade: 6, 7

Content Area: Physical Science

- 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

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Content Area: Physical Science

- 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, attending to 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, taking measurements, 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)

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

6.EE.A.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

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Content Area: Physical Science

Modifications for SpEd/ESL/Students at Risk/Gifted

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- 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

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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

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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 binary counting. Assessment does not include the specific mechanism of any given device.]

Big Ideas:

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 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)

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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)

<p>Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.</p> <p><i>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)</i></p> <hr/> <p>Connections to Nature of Science</p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <p><i>Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS4-1)</i></p>	<p><i>explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2)</i></p> <p><i>However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)</i></p> <p>PS4.C: Information Technologies and Instrumentation</p> <p><i>Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)</i></p>	
<p>The chart above entitled "Performance Expectations" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas.</p>		

Essential Questions:

● 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

Enduring Understandings:

- 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

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frequency, 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., height or 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 of motion).

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- 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
 - ruler
 - yard stick
 - meter stick
 - tape measures
 - stopwatch
 - architect scale
 - thermometer
- Construction material
 - paper
 - scissors
 - glue
 - tape
 - markers
 - crayons

Suggested Vocabulary

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

- o staplers
- o holepunch
- Chemistry lab equipment
- o beakers

- o flasks
- o graduated cylinders
- o pipett
- o Etc.

- Demonstration materials

Technology:

- Active board
- Ipads
- Computers
- Internet access

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- 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 and frequencies.
 - Light, including brightness (amplitude) and color (frequency).
 - Various materials through which the waves are reflected, absorbed, or transmitted.
 - 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

Modification Strategies/Activities: ●

Review

- Reinforce
- Reteach
- Enrich
- Performance Assessment Writing

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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!

- Graphic Organizers
- Word Bank
- Extra Time
- Study Guide
- Post vocabulary around the room

“Making Music with Glass”

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

“Coat Hanger Chimes Activity”

- http://www.ccssoh.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.

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

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- 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

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- 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

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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

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- 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

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- 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

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BOE Approved August 2022

MS-ETS1 - Engineering Design

NGSS:

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Big Ideas:

- The Engineering Design Process is a method that is used to solve technological challenges to change and improve products for the way we live.

ETS1.A: Defining and Delimiting Engineering Problems

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. **(MS-ETS1-1)**

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. **(MS-ETS1-4)**
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. **(MS-ETS1-2), (MS-ETS1-3)**
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. **(MS-ETS1-3)**
- Models of all kinds are important for testing solutions. **(MS-ETS1-4)**

ETS1.C: Optimizing the Design Solution

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. **(MS-ETS1-3)**
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.**(MS-ETS1-4)**

Performance Expectations

**Science and
Engineering Practices**

**Disciplinary Core
Ideas**

Crosscutting Concepts

<p>Asking Questions and Defining Problems</p> <p>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.</p> <p>Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)</p> <p>Developing and Using Models</p> <p>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.</p> <p>Develop a model to generate data to</p>	<p>ETS1.A: Defining and Delimiting Engineering Problems</p> <p>The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)</p> <p>ETS1.B: Developing Possible Solutions</p> <p>A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)</p> <p>There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2),</p>	<p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <p>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-ETS1-1)</p> <p>The uses of technologies and 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-ETS1-1)</p>
	<p>(MS-ETS1-3) Sometimes parts of different solutions</p>	

test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

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-ETS1-3)

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.

Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)

Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution

Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS ETS1-3)

The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

Essential Questions:

1. What is the design process and how is it used?
2. Why is brainstorming important when modifying or improving a product?
3. Why do people work in teams when solving design problems?
4. What is meant by constraints and criteria?

Enduring Understandings:

- The Engineering Design Process is a method that is used to solve technological challenges to change and improve products for the way we live.

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Grade: 6 -8 Content Area: Engineering Technology & Application of Science

5. Which step in the design process uses a design brief? Why?
6. Which step in the design process uses a decision matrix? Why?
7. Why are design elements considered when engineers and designers invent or innovate a product?

Knowledge, Skills, and Understandings:

Knowledge and Skills

It is expected that students will:

- Describe the design process and how it is used to aid in problemsolving.
- Describe the elements of design.
- Recognize design criteria and constraints.
- Describe the purpose and importance of working in a team.
- Use the design process to solve a technical problem.
- Apply the elements of design to the design process.
- Explain a design brief and apply the concept when using the design process.
- Operate effectively as a member of a team to complete a design project.
- Use a decision matrix to select the best solution to a design.

Understandings

1. Many different design processes are used to guide people in developing solutions to problems. 2. The design brief is a tool for defining the problem; it is an agreement between the engineer and client. 3. Engineers use design briefs to explain the problem, identify solution expectations, and establish project constraints. 4. Design teams use brainstorming techniques to generate large numbers of ideas in a short amount of time, striving for quantity, not quality.

5. A decision matrix is a tool used to compare solution ideas to the criteria so that you can select the best solution.

Instructional Materials/Resources:

- Interactive Engineering Notebook
- RecycledMaterials
 - Cans / water bottles
 - paper rolls

Suggested Vocabulary

- engineer
- Design Process
- prototype
- evaluate
- technical drawing
- design

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Grade: 6 -8 Content Area: Engineering Technology & Application of Science

o egg cartons

o ect.

● PLTW equipment

o Specific for each Gateway Course

o computer access

● innovation

● constraints

● engineering notebook

● designer

Technology:

- computers
- iPads
- tablets
- 3D CAD programs
 - o Revit
 - o Inventor
- Computer Programming Platforms
 - o RobotC
 - o Python

Recommended Instructional Activities:

In grades 6 - 8 our students all take Project Lead the Way (PLTW) Gateway courses. We offer all 9 of the following courses:

Gateway:

- Design & Modeling (DM)
- Automation & Robotics (AR)
- Green Architecture (GA)
- Energy & the Environment (EE)
- Flight & Space (FS)
- Science of Technology (ST)
- Magic of Electrons (ME)
- Medical Detectives (MD)
- Intro to Computer Science I & II (ICS)

Extension Strategies/Activities:

Shark Tank:

- Using the Design Process, students can solve a real world problem of their own choosing and in tandem with the math and science teachers present their solution to community members for feedback.

Modification Strategies/Activities:

- guided notes
- online resources
- extended time when necessary
- differentiated instruction

Cross-curricular Connections/Standards:

Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include:

Physical Science: MS-PS3-3

Connections to MS-ETS1.B: Developing Possible Solutions Problems include:

Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5

Connections to MS-ETS1.C: Optimizing the Design Solution include:

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Grade: 6 -8 Content Area: Engineering Technology & Application of Science

Physical Science: MS-PS1-6

Common Core State Standards Connections:

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)

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-ETS1-3)

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-ETS1-2),(MS-ETS1-3)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2)

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 ETS1-1)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)

SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS ETS1-4)

Mathematics:

MP.2 Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)

7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), 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-ETS1-1),(MS ETS1-2),(MS-ETS1-3)

7.SP Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)

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

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Suggested Assessments:

- Presentations
- Projects
- Performance Evaluations
- Practicum
- Homework
- Exit tickets

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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

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- 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

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- 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

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MS-LS1 From Molecules to Organisms: Structure & Processes

NGSS:

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and nonliving things, and understanding that living things may be made of one cell or many and varied cells.]

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

[Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

[Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

[Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

[Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water.]

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Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

[Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

[Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

[Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

Big Ideas:

● LS1.A: Structure and Function

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) Text: *“From Bacteria to Plants” Prentice Hall*
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) Text: *“Cells and Heredity” Prentice Hall*
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) Text *“Human Biology and Health” Prentice Hall*

● LS1.B: Growth and Development of Organisms

- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) *“Cells and Heredity” Prentice Hall*
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) Text: *“From Bacteria to Plants” Prentice Hall*
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) Text: *“From Bacteria to Plants” Prentice Hall, “Cells and Heredity” Prentice Hall*

● LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also

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releases oxygen. These sugars can be used immediately or stored for growth or later use.

(MS-LS1- 6)Text: *“From Bacteria to Plants” Prentice Hall, “Cells and Heredity” Prentice Hall*

- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)Text: *“From Bacteria to Plants” Prentice Hall, “Cells and Heredity” Prentice Hall, Text “Human Biology and Health” Prentice Hall*

● LS1.D: Information Processing

- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), 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. (MS-LS1- 8) Text *“Human Biology and Health” Prentice Hall*

● PS3.D: Energy in Chemical Processes and Everyday Life

- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) Text: *“From Bacteria to Plants” Prentice Hall, “Cells and Heredity” Prentice Hall*
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)Text: *“From Bacteria to Plants” Prentice Hall, “Cells and Heredity” Prentice Hall, Text “Human Biology and Health” Prentice Hall*

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Performance Expectations			
	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

<p>Developing and Using Models</p> <p>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.</p> <p><i>Develop and use a model to describe phenomena. (MS-LS1-2)</i></p> <p><i>Develop a model to describe unobservable mechanisms. (MS LS1-7)</i></p> <p>Planning and Carrying Out Investigations</p> <p>Planning and carrying out investigations in 6-8 builds on K 5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.</p> <p><i>Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)</i></p> <p>Constructing Explanations and Designing Solutions</p>	<p>LS1.A: Structure and Function</p> <p><i>All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)</i></p> <p><i>Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)</i></p> <p><i>In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)</i></p> <p>LS1.B: Growth and Development of Organisms</p> <p><i>Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)</i></p> <p><i>Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)</i></p>	<p>Cause and Effect</p> <p><i>Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)</i></p> <p><i>Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MSLS1-5)</i></p> <p>Scale, Proportion, and Quantity</p> <p><i>Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)</i></p> <p>Systems and System Models</p> <p><i>Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)</i></p> <p>Energy and Matter</p> <p><i>Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)</i></p> <p><i>Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1- 6)</i></p> <p>Structure and Function</p> <p><i>Complex and microscopic structures and systems can be visualized, modeled, and used to describe</i></p>
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			<i>how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they</i>	
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Essential Questions:

- How do cells carry out all the functions necessary for an organism's growth and health?
- How do the body systems work together to carry out all the functions necessary for an organism's growth and health?
- What are the characteristic behaviors that increase the success at reproduction?
- What are the specialized features and ways that increase the success of plant reproduction?
- How do genetic factors and local conditions affect the growth of adult plants?
- How do plants get their energy for growth and development?
- How does animal digestion work?
- How do our sensory receptors help us react to stimuli in the environment?
- How does photosynthesis work?
- How does cellular respiration work?
- How do the structures of organisms contribute to life's functions?
- How do matter and energy move through individual organisms and ecosystems?
- How does genetic variation among organisms in species affect survival and reproduction?

Enduring Understandings:

- All living things are made up of living cells and organisms can be single celled or multicellular.
 - Each cell has structures (organelles) that have a function, including a cell membrane around the cell that affects traffic in and out.
- Cells make up tissues, which make up organs, which make up organ systems, which work together to form a functioning multicellular organism.
- Animals have characteristic behaviors to increase their success at reproduction (i.e. courtship behaviors, etc.).
- Plants reproduce in many ways - also to increase their reproductive success.
 - Plant growth is affected by genetics and local conditions where it grows.
 - Plants (and green algae) use photosynthesis to create energy for growth and storage while releasing oxygen.
- Animals break down consumed food through a series of chemical reactions that release energy to support their growth and repair.
- Animals have sensory receptors that brings in signals from the world and transmit them to the brain for a reaction (and to build a memory collection for future use) and

they can be electromagnetic,
mechanical,

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chemical.

- The chemical process (of photosynthesis) that produces sugars needs sunlight for its energy and uses carbon dioxide and water, while releasing oxygen.
- Cellular respiration in plants and animals involves chemical reactions with oxygen

that releases energy and carbon dioxide.

Knowledge, Skills, and Understandings:

Knowledge

It is expected that students will:

- Conduct investigation using a microscope to observe cells.
- Distinguish between living/nonliving.
- Develop and use models to show how cell parts work together.
- Distinguish between plant and animal cells.
- Use argument based on evidence to support how systems work together in an organism.
- Use oral or written argument to prove that animal behaviors affect survival.
- Use oral or written argument to demonstrate that specialized plant structures increase survival rates.
- Explain how energy flows in and out of organisms.
- Cite evidence to communicate the scientific explanation of the change of matter and energy through photosynthesis.
- Use evidence to communicate the scientific explanation of the change of matter and energy through cellular respiration. (Ex. CO₂ and bromothymol blue)

Skills

- access information
- implement innovations
- think creatively

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- make judgments and decisions
- manage goals and time

Understandings

Identify the phenomenon under investigation:

- From the given investigation plan, students identify and describe* the phenomenon under investigation, which includes the idea that living things are made up of cells.
- Identify and describe the purpose of the investigation, which includes providing evidence for the following ideas: that all living things are made of cells (either one cell or many different numbers and types of cells) and that the cell is the smallest unit that can be said to be alive.
- All living things are made up of living cells and that organisms can be single celled or multicellular. ● Each cell has structures (organelles) that have a function, including a cell membrane around the cell that affects traffic in and out. ● Cells make up tissues, which make up organs, which make up organ systems, which work together to form a functioning multicellular organism.
- Animals have characteristic behaviors to increase their success at reproduction (i.e. courtship behaviors, etc.). ● Plants reproduce in many ways - also to increase their reproductive success.
- Plant growth is affected by genetics and local conditions where it grows.
- Plants (and green algae) use photosynthesis to create energy for growth and storage while releasing oxygen. ● Animals break down consumed food through a series of chemical reactions that release energy to support their growth and repair.
- Animals have sensory receptors that bring in signals from the world and transmit them to the brain for a reaction (and to build a memory collection for future use) and they can be electromagnetic, mechanical, chemical.
- Chemical process (of photosynthesis) that produces sugars needs sunlight for its energy and uses carbon dioxide and water, while releasing oxygen.
- Cellular respiration in plants and animals involves chemical reactions with oxygen that releases energy and carbon dioxide.

Instructional Materials/Resources:

Suggested Vocabulary

****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
 - yardstick
 - meterstick
 - tape measure
 - stopwatch
 - architect's scale
 - thermometer
- Construction material
 - paper
 - scissors
 - glue
 - tape
 - markers
 - crayons
 - staplers
 - holepunch
- Chemistry lab equipment
 - beakers
 - flasks
 - graduated cylinders
 - pipette
 - Etc.
- Demonstration materials
 - marbles
 - rubberbands
 - non-latex balloons
 - bowling ball
 - feathers
 - flashlights
 - batteries
 -
- Plant materials
 - seeds

- microscopic
- multicellular
- unicellular
- prokaryotic
- eukaryotic
- organelles
- nucleus
- chloroplasts
- mitochondria
- cell membrane
- cell wall
- tissue
- organ
- organ system
- organism
- circulatory
- excretory
- digestive
- respiratory
- muscular
- nervous
- stamen
- pistil
- stigma
- migration
- radiant energy
- chemical energy
- chlorophyll
- chloroplast
- cellular respiration
- conservation of matter and energy

Technology:

- Activeboard
- Ipads
- Computers
- Internet access

- 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, “Environmental Science” Prentice Hall, and “DNA & Heredity” Prentice Hall.

Recommended Instructional Activities:

“From Bacteria to Plants” Prentice Hall

- **Mystery Object:** Study a mystery object for several days to determine whether or not it is alive. **MS-LS1-5**
- **Video Script:** You are narrating a video called Living on Land, which is written from the perspective of a plant. Write a one-page script for your narration. Be sure to discuss the challenges that life on land poses for plants and how they meet their needs. **(MS-LS1-4)**

“Cells and Heredity” Prentice Hall

- Ask students to examine a drop of tap water under the microscope. Most likely, the water will not contain microorganisms, but it could possibly contain non-disease-causing ones, as treated tap water is not sterile. **(MS-LS1-2)**
- Challenge the students to model an animal cell using recyclable materials. **(MS-LS1-2)**

“Human Biology and Health” Prentice Hall

- “What do you exhale?” Students will use two test tubes along with 10 mL of water and a few drops of bromothymol blue to compare the solutions. This teaches them whether carbon dioxide is present in exhaled air. **(secondary to MS-LS1-7)**

Extension Strategies/Activities:

“Investigating Photosynthesis”

- <http://ngss.nsta.org/Resource.aspx?ResourceID=170>
(MS LS1-6)
- <http://serc.carleton.edu/sp/mnstep/activities/35653.html> ●
Students design and conduct simple experiments using elodea (aquatic plant sold in pet stores) and Bromothymol blue to determine whether plants consume or release carbon dioxide in the process of photosynthesis. Students will record their data which will be used to conclude whether carbon dioxide was consumed or released by the elodea. Through class discussion of student data, students will learn that carbon

Modification Strategies/Activities:

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

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