Verona Public School District
Curriculum Overview

6th Grade Science

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Curriculum Developed:
Winter 2012
February 2017
July 2017
June 2018

Board Approval Date:
March 27, 2012
August 30, 2016
August 29, 2017
July 31, 2018

Verona Public Schools
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Verona Public Schools Mission Statement:

The mission of the Verona Public Schools, the center of an engaged and supportive community, is to empower students to achieve their potential as active learners and productive citizens through rigorous curricula and meaningful, enriching experiences.

Course Description:

The 6th grade science curriculum provides "opportunities for students to engage directly with natural phenomena, tools of science, real-world problems and technical and design challenges. The course provides an instructional framework to help all students develop age-appropriate scientific habits of mind while building on students' prior knowledge and experiences and allowing them to apply knowledge and problem solving strategies in new contexts," (STC, 2012).

The 6th grade science program makes use of three Science and Technology Centers kits: **Energy, Forces, and Motion; Structure and Function; and Earth's Dynamic Systems**. The Energy, Forces, and Motion unit teaches science and engineering practices, teachable core ideas, and crosscutting concepts that are integrated into every lesson. The unit relates Newtonian physics to objects that roll, fall, and collide. Join us as we plan investigations and design solutions to explore energy, forces, and motion. In Structure and Function students will explore cells, cell organelles, photosynthesis and cellular respiration, levels of biological organization, finally culminating by investigating sensory systems and nervous system function. In Earth's Dynamic Systems students seek answers to the question, "How do the dynamic systems of Earth change its surface?" Students will investigate earthquakes, plate tectonics, the cycling of matter on the planet's surface, volcanoes, and the age of the earth. The unit culminate in building an argument based upon evidence that the Earth is a changing, dynamic system of great age.

Prerequisite(s):

5th grade

Standard 8: Technology Standards

8.1: Educational Technology: *All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*	**8.2: Technology Education, Engineering, Design, and Computational Thinking - Programming:** *All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.*
A. Technology Operations and Concepts B. Creativity and Innovation C. Communication and Collaboration D. Digital Citizenship E. Research and Information Fluency **X** F. Critical thinking, problem solving, and decision making	A. The Nature of Technology: Creativity and Innovation B. Technology and Society C. Design **X** D. Abilities for a Technological World E. Computational Thinking: Programming

SEL Competencies and Career Ready Practices

Social and Emotional Learning Core Competencies: *These competencies are identified as five interrelated sets of cognitive, affective, and behavioral capabilities*	**Career Ready Practices:** *These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.*
Self-awareness: The ability to accurately recognize one's emotions and thoughts and their influence on behavior. This includes accurately assessing one's strengths and limitations and possessing a well-grounded sense of confidence and optimism.	**X** CRP2. Apply appropriate academic and technical skills. CRP9. Model integrity, ethical leadership, and effective management. CRP10. Plan education and career paths aligned to personal goals.
Self-management: The ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. This includes managing stress, controlling impulses, motivating oneself, and setting and working toward achieving personal and academic goals.	CRP3. Attend to personal health and financial well-being. **X** CRP6. Demonstrate creativity and innovation. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity.
Social awareness: The ability to take the perspective of and empathize with others from diverse backgrounds and cultures, to understand social and ethical norms for behavior, and to recognize family, school, and community resources and supports.	CRP1. Act as a responsible and contributing citizen and employee. CRP9. Model integrity, ethical leadership, and effective management.
Relationship skills: The ability to establish and maintain healthy and rewarding relationships with diverse individuals and groups. This includes communicating clearly, listening actively, cooperating, resisting inappropriate social pressure, negotiating conflict constructively, and seeking and offering help when needed.	**X** CRP4. Communicate clearly and effectively and with reason. CRP9. Model integrity, ethical leadership, and effective management. CRP12. Work productively in teams while using cultural global competence.
Responsible decision making: The ability to make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others.	CRP5. Consider the environmental, social, and economic impact of decisions. CRP7. Employ valid and reliable research strategies. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership, and effective management.

Standard 9: 21st Century Life and Careers

9.1: Personal Financial Literacy: *This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.*	**9.2: Career Awareness, Exploration & Preparation:** *This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.*	**9.3: Career and Technical Education:** *This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.*
X A. Income and Careers B. Money Management C. Credit and Debt Management D. Planning, Saving, and Investing E. Becoming a Critical Consumer F. Civic Financial Responsibility G. Insuring and Protecting	A. Career Awareness (K-4) **X** B. Career Exploration (5-8) C. Career Preparation (9-12)	A. Agriculture, Food & Natural Res. B. Architecture & Construction C. Arts, A/V Technology & Comm. D. Business Management & Admin. E. Education & Training F. Finance G. Government & Public Admin. H. Health Science I. Hospital & Tourism J. Human Services K. Information Technology L. Law, Public, Safety, Corrections & Security M. Manufacturing N. Marketing **X** O. Science, Technology, Engineering & Math P. Transportation, Distribution & Log.

Course Materials

Core Instructional Materials: *These are the board adopted and approved materials to support the curriculum, instruction, and assessment of this course.*	**Differentiated Resources**: *These are teacher and department found materials, and also approved support materials that facilitate differentiation of curriculum, instruction, and assessment of this course.*

• STC Kits
  o Energy, Forces and Motion
  o Structure and Function
  o Earth's Dynamic Systems
	• www.CK12.org
	• TWIG videos
	• BrainPop
	• Educational videos on YouTube

HB Whitehorne 6th Grade Science

Unit Title / Topic:Energy, Forces and Motion	Unit Duration: 70 days

Stage 1: Desired Results

Established NGSS Goals:

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

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

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

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

MS-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.

Science and Engineering Practices

Asking Questions and Defining Problems
- Ask questions that can be investigated within the scope of the classroom, 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)
- 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)

Planning and Carrying Out Investigations
- 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
- Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)

Developing and Using Models
- Develop a model to describe unobservable mechanisms. (MS-PS3-2)
- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

Analyzing and Interpreting Data
- Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)

Engaging in Argument from Evidence
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

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)

Disciplinary Core Ideas

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)
- 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)

PS3.A: Definitions of Energy
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)

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)

Crosscutting Concepts

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS-PS2-5)

Systems and System Models
- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1)
- Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2)

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)
- 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)
- 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)

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)**

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

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

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

Transfer Goal:

Students will be able to independently use their learning of energy, forces, and motion to plan and conduct their own procedures, analyze diagrams, and make logical connections to the physical world around us.

Students will understand that:

- Energy can change form and be transferred between objects
- Change in motion depends on the sum of the forces on an object and its mass
- Collisions can transfer energy between objects and cause changes in motion
- The acceleration of an object is inversely related to the object's mass
- The force of gravity causes the objects to accelerate
- The net force on an object is the sum of all forces on the object and can describe the object's motion
- Mass describes the amount of matter in a body and weight is a measure of the force of gravity, but they are directly proportional
- Graphs show changes in an object's motion

Essential Questions:

- Why do objects speed up, slow down, or change direction?
- How can magnets affect motion?
- How can we predict if the motion of an object change or stay the same?
- How can gravity affect the motion of objects on Earth?
- How does Newton's third law play a role on Earth and in space?
- What happens to energy when two objects collide?
- How does energy transform from Potential to Kinetic energy?

Students will know:

- Energy, force, mass, speed, acceleration, reference frame, velocity, balanced forces, net force, diagram, gravity, variables, Newtons, weight, magnetism, magnetic poles, magnetic fields, controlled experiment, independent and dependent variables, inertia, Newton's Laws of Motion, GPE, KE PE, work, system, collisions, force pairs, friction, velocity, conservation of energy, energy transfer, energy transformation, momentum, conservation of momentum, criteria, constraints, prototype, optimize, modification, Galileo Galilei, Sir Isaac Newton, Robert Hooke,

Students will be able to:

- Plan and carry out investigations to answer questions about forces, energy changes and motion
- Construct and analyze graphs to understand speed and motion
- Model the energy changes taking place in a moving system
- Take specific measurements during investigations to collect and graph data
- Design data tables that will reflect the necessary information needed to prove a hypothesis
- Analyze various factors including mass and their effect on energy and motion
- Interpret Newton's Laws of Motion and how they apply to the world around us

	● Apply concepts about gravitational force and the strength of magnetic forces to different situations ● Differentiate between potential (GPE) and kinetic energy, factors that affect both, and the transformation of one to the other ● Apply the law of conservation of energy to explain energy transfer during collisions ● Make predictions about motion under different situations (mass, speed)

Stage 2: Acceptable Evidence

Transfer Task

Acceptable Evidence:

Formal

- Teacher made Quizzes and Tests
- Laboratory Reports

Informal

- Class discussion
- Journaling
- Application of scientific concepts in class conversations, debates and discussions.
- Application of scientific vocabulary
- Meaningful homework

TRANSFER TASK:

Students will complete the following transfer task: There is a new student that has just moved to town and has been placed in your science class. Since she has missed the first half of the year and all the physical science topics you have been taught, your teacher has asked each of the students in your class to create a " Presentation" featuring the most important ideas and concepts that we've studied. This can be done through using Google Slides or a Paper Booklet. Using the list of requirements, create a " Presentation" so the new student can see the ways in which the laws and theories of physics exist all around us.

Students will complete a written assessment that encapsulates important unit concepts. They interpret diagrams and graphs to answer specific questions. They also create an experiment that must correspond to a given hypothesis. This includes the development of a relevant data table and the identification of the important variables

Reference Materials

● STC Kits: o Energy, Forces, and Motion Kit ● Chromebooks	● www.CK12.org ● TWIG videos ● BrainPop ● Educational videos on YouTube ● Kahoot

HB Whitehorne 6th Grade Science

Unit Title / Topic: Structure and Function	Unit Duration: 45 days

Stage 1: Desired Results

Established NGSS Goals:

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 non-living cells, and understanding that living things may be made of one cell or many and varied cells.]*

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. *[Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]*

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. *[Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]*

MS-LS1-4. 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. 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.]*

Science and Engineering Practices

Developing and Using Models
- Develop and use a model to describe phenomena. (MS-LS1-2)
- Develop a model to describe unobservable mechanisms. (MS-LS1-7)

Planning and Carrying Out Investigations
- Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)

Constructing Explanations and Designing Solutions
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5),(MS-LS1-6)

Engaging in Argument from Evidence
- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)
- Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)

Obtaining, Evaluating, and Communicating Information
- 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-LS1-8)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)

Disciplinary Core 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)
- 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)
- 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)

LS1.B: Growth and Development of Organisms
- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

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 releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

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)

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)
- 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)

Crosscutting Concepts

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)
- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5)

Scale, Proportion, and Quantity
- Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)

Systems and System Models
- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)

Energy and Matter
- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)

Structure and Function
- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)

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-LS1-1)

Connections to Nature of Science

Science is a Human Endeavor
- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5),(MS-LS1-6)

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-LS1-5),(MS-LS1-6)

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3),(MS-LS1-4)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-3),(MS-LS1-4)

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-LS1-5),(MS-LS1-6)

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-LS1-1)

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-LS1-8)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5),(MS-LS1-6)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2),(MS-LS1-7)

Mathematics –

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-6)

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5)

6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5)

Transfer Goal:

Students will be able to <u>independently</u> use their learning to explain how the structure and function of organisms contribute to their everyday survival

Students will understand that:
- The microscope, which is a necessary tool in the study of cells, needs to be properly used and maintained
- Cells are the building blocks of all life and the role they play in the development and survival of an organism
- Organelles interact and rely on each other, acting as smaller subsystems within a larger system, the cell
- Through the process of photosynthesis many organisms produce their own food through the use of specific structures
- Through the process of cellular respiration, organisms break down food molecules to release energy for cellular functions and body processes

Essential Questions:
- How do the structure and function of organisms contribute to their survival?
- What do we already know about how living things survive in their environment, and how can we learn more?
- What roles can cells play in the development and survival of organisms?
- What structure does a cell need in order to survive?
- What roles do matter and energy play during photosynthesis?
- Where do cells get the resources they need to aid in an organism's survival?

Students will know:
- Archaea, cell membrane, cell theory, compound light microscope, cytoplasm, DNA, eukaryotic, nucleus, organelle, prokaryotic, ribosome, species, unicellular, wet-mount slide, scientific illustration, differentiation, multicellular, cell wall, central vacuole, chlorophyll, chloroplast, endoplasmic reticulum, golgi body, lysosome, mitochondria, cell membrane, autotroph, decomposer, heterotroph, omnivore, photosynthesis, transpiration, glucose, synthesize, epidermis, guard cell, mesophyll, phloem, stomata, transpiration, xylem, aerobic, anaerobic, ATP

Students will be able to:
- Discuss what they know about structure and function using a KWL chart
- Use a compound light microscope to observe prepared microscope slides
- Observe unicellular and multicellular organisms and the structures within plant and animal cells
- Make claims about the functions of the observed structures and their similarities
- Draw and describe the structures of Euglena, Paramecium, and Elodea
- Observe, read, and discuss a variety of cells and their specific function based on their functions
- Identify certain organelles in both plant and animal cells
- Recognize the process of photosynthesis, its components, and its presence of chlorophyll in leaves
- Design and carry out experiment to gather evidence as to what materials are required for photosynthesis (stomata, epidermis, chlorophyll
- Plan and carry out an investigation to determine the form of energy released during cellular respiration

Stage 2: Acceptable Evidence

Transfer Task

Acceptable Evidence:

Formal

- Teacher made quizzes that emphasize transfer of knowledge
- Performance based assessments
- Laboratory Reports

Informal

- Class discussion
- Journaling
- Application of scientific concepts in class conversations, debates and discussions.
- Application of scientific vocabulary
- Meaningful homework

Transfer Task

Compare the parts of a cell to the parts of a school or town community, and describe correlations between the functions of the two. Students must use at least 6 organelles in the description, include the processes of photosynthesis and cellular respiration, and show how the parts of a cell and the parts of a school/community perform similar functions.

HB Whitehorne 6th Grade Science

Unit Title / Topic: Earth's Dynamic Systems	Unit Duration: 40 days

Stage 1: Desired Results

Established Goals:

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.][Assessment Boundary : Assessment does not include recalling the names of specific periods or epochs and events within them.]

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]

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

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado prone regions or reservoirs to mitigate droughts).]

Science and Engineering Practices

Developing and Using Models
- Develop and use a model to describe phenomena (MS-ESS2-1)
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Planning and Carrying Out Investigations
- 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.

Analyzing and Interpreting Data
- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)
- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)

Constructing Explanations and Designing Solutions
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS1- 4)
- Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2), (MS-ESS3-1)
- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Connections to Nature of Science

Scientific Knowledge is Open to Revision in Light of New Evidence
- Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth
- The geologic time scale interpreted from rock strata provides a way to organize Earth's history . Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1- 4)
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old seafloor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)

ESS2.A: Earth's Materials and Systems
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

ESS3.A: Natural Resources
- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

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

ESS3.C: Human Impacts on Earth Systems
- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)

Crosscutting Concepts

Patterns
- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)
- Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5), (MS-ESS3- 1)
- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)

Scale Proportion and Quantity
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.(MS-ESS1-4), (MS-ESS2-2)

Systems and System Models
- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

Energy and Matter
- Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Stability and Change
- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World
- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1)
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)

Common Core State Standards Connections:
ELA/Literacy –
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2),(MS-ESS2-3),(MS-ESS3-1),(MS-ESS3-2)
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-ESS2-3), (MS-ESS3-2)
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-ESS2-3)
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-ESS2-2), (MS-ESS3-1)
WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)
WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)
WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1),(MS-ESS3-4)SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-6)
Mathematics –
MP.2 Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3),
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-ESS2-2),(MS-ESS2-3)
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-ESS2-2),(MS-ESS2-3)
6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3)
7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS3-3)
6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3)
7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3)

Transfer Goal:

Students will be able to <u>independently</u> use their learning to explain how the systems that make up the Earth's rocky surface constantly undergo changes.

Students will understand that:

- The dynamic systems of Earth changes its surface.
- The dynamic systems of Earth can be used to understand the past and prepare for the future.
- Erath is adynamic planet undergoing constant changes at different sizes and timescales.
- Geologic processes cause changes that can be rapid or gradual.
- Scientific explanations are based on evidence reasoning.
- Fossilized organisms and rock features are the result of geologic processes.
- Geologic processes continue to change Earth's surface in the present day.
- Scientific discoveries are subject to revaluation, and explanations may be revised based on new evidence.

Essential Questions:

- **<u>L2:</u>** Why are some structures damaged when Earth shakes?
- **<u>L3:</u>** How can we collect data about earthquakes?
- **<u>L4:</u>** How do changes in the lithosphere affect Earth's surface?
- **<u>L5:</u>** How do heat and pressure impact geologic features?
- **<u>L8:</u>** How have geoscience processes changed Earth's surface?
- **<u>L9:</u>** What do fossils and layers of sediment tell us about Earth's past?
- **<u>L10:</u>** How do geoscience processes impact the distribution of resources on Earth?
- **<u>L11:</u>** What evidence suggests that Earth is a dynamic geological system?
- **<u>L12:</u>** How can we use knowledge of Earth's dynamic systems to understand the past and prepare for the future?

Students will know:

- Abrasion, aftershock, asthenosphere, biodiversity, body wave, brittle, cinder cone, cinder cone volcano, composite volcano, constraint, constructive, continental crust, continental drift, controlled experiment, convection, convection mantle, convergent plate boundary, core, crater, criteria, crust, deformation, dependent variable, deposition, diagram, divergent plate boundary, ductile, dynamic, earthquake, earthquake swarm, elasticity, epicenter, erosion, excavate, fault, fissure, force, fossil, fossil record, fracture, friction, geology, geyser, glacial ablation, glacial rebound, glacier, groundwater, groundwater mining, hot spot, hot spring, igneous rock, impact crater, independent variable, index fossil, index of refraction, intensity, lahar, landfill mining, landform, latitude, law of superposition, lithosphere, loess, longitude, magma, magnetite, magnitude, mantle, metamorphic rock, mineral, mitigate, model, modification, moraine, oceanic ridge, oceanic trench, optimize, P-wave, paleontology, pangaea, petrology, plate, plate boundary, plate tectonics, prototype, rift valley, ring of fire, rock cycle, s-Wave, sand dune, seafloor spreading, sedimentary rock, sediments, seismic station, seismic wave, seismogram, seismograph, seismology, seismometer, sinkhole, strain, strata, stress, subduction, submarine, supercontinent, surface wave, suspended load, tectonic plate, tiltmeter, transform plate boundary, Tsunami, vent, viscosity, weathering

Students will be able to:

- Use models to identify locations associated with geologic processes and phenomena.
- Examine real-world observations and images related to geologic processes and phenomena.
- Describe what a data set represents and interpret similarities and differences within it.
- Use evidence and reasoning to construct explanations for geologic processes and phenomena related to the Burgess Shale.
- Reflect on how geologic processes affect a landscape.

Stage 2: Acceptable Evidence

Transfer Task

Acceptable Evidence:

Formal

- Teacher made quizzes that emphasize transfer of knowledge
- Performance based assessments
- Laboratory Reports

Informal

- Class discussion
- Journaling
- Application of scientific concepts in class conversations, debates and discussions.
- Application of scientific vocabulary
- Meaningful homework

Transfer Task

Students will research geodynamic events (earthquakes) in a specific geographic region. Then students will analyze and interpret data from their research to look for patterns, write proposals for geodynamic event preparedness, and present their findings to the class.