

Missouri Middle School Science Content Standards, Grades 6 - 8

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MIDDLE SCHOOL SCIENCE	Boardworks Middle School Science Presentation
Strand 1: Properties and Principles of Matter and Energy	
1. Changes in properties and states of matter provide evidence of the atomic theory of matter	
A. Objects, and the materials they are made of, have properties that can be used to describe and classify them - Grade 6	
<i>a. Identify matter is anything that has mass and volume</i>	–
<i>b. Describe and compare the volumes (the amount of space an object occupies) of objects or substances directly, using a graduated cylinder, and/or indirectly, using displacement methods</i>	–
<i>c. Describe and compare the masses (amounts of matter) of objects to the nearest gram using a balance</i>	–
d. Classify the types of matter in an object into pure substances or mixtures using their specific physical properties	What is a Mixture?
A. Objects, and the materials they are made of, have properties that can be used to describe and classify them - Grade 8	
a. Identify elements (unique atoms) and compounds (molecules or crystals) are pure substances that have characteristic properties	Elements and Compounds
b. Describe the physical and chemical properties (e.g., magnetic attraction, conductivity, melting point and boiling point, reactivity) of pure substances (elements or compounds) (e.g., copper wire, aluminum wire, iron, charcoal, sulfur, water, salt, sugar, sodium bicarbonate, galena, quartz, magnetite, pyrite) using appropriate senses and tools	Elements and Compounds Metals and Nonmetals Changing State Particles in Action Metalloids
B. Properties of mixtures depend upon the concentrations, properties, and interactions of particles - Grade 6	
a. Describe the properties of each component in a mixture/solution and their distinguishing properties (e.g., salt water, oil and vinegar, pond water, Kool-Aid)	Solutions
b. Describe appropriate ways to separate the components of different types of mixtures (sorting, evaporation, filtration, magnets, boiling, chromatography, screening)	Separating Mixtures Chromatography
c. Predict how various solids (soluble/insoluble) behave (e.g., dissolve, settle, float) when mixed with water	Solutions
C. Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification - Grade 6	

a. Describe evidence (e.g., diffusion of food coloring in water, light reflecting off of dust particles in the air, condensation of water vapor by increased pressure or decreased temperature) that supports the theory that matter is composed of small particles (atoms, molecules) that are in constant, random motion	What Are Atoms? Particles in Action
C. Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification - Grade 8	
a. Describe evidence (e.g., diffusion of colored material into clear material such as water; light reflecting off of dust particles in air; changes in physical properties and reactivity such as gold hammered into foil, oil spreading on the surface of water, decay of organic matter, condensation of water vapor by increased pressure) that supports the theory that matter is composed of moving particles too small to be seen (atoms, molecules)	What Are Atoms? Atomic Structure Particles in Action
D. Physical changes in the state of matter that result from thermal changes can be explained by the Kinetic Theory of Matter - Grade 6	
a. Describe the relationship between the change in the volume of water and changes in temperature as it relates to the properties of water (i.e., water expands and becomes less dense when frozen)	Changes of Matter
D. Physical changes in the state of matter that result from thermal changes can be explained by the Kinetic Theory of Matter - Grade 7	
a. Describe the relationship between temperature and the movement of atmospheric gases (i.e., warm air rises due to expansion of the volume of gas, cool air sinks due to contraction of the volume of gas)	What is Weather?
D. Physical changes in the state of matter that result from thermal changes can be explained by the Kinetic Theory of Matter - Grade 8	
a. Using the Kinetic Theory model, illustrate and account for the physical properties (i.e., shape, volume, malleability, viscosity) of a solid, liquid, or gas in terms of the arrangement and motion of molecules in a substance	Particles in Action
b. Use the Kinetic Theory model to explain changes in the volume, shape, and viscosity of materials in response to temperature changes during a phase change	Changing State
c. Predict the effect of energy transfer on the physical properties of a substance as it changes to or from a solid, liquid, or gas (i.e., phase changes that occur during freezing, melting, evaporation, boiling, condensation)	Changing State Changes of Matter
F. The periodic table organizes the elements according to their atomic structure and chemical reactivity - Grade 8	
a. Identify more than 100 known elements (unique atoms) exist that may be combined in nature or by man to produce compounds that make up the living and nonliving substances in the environment	Elements and Compounds

G. Properties of objects and states of matter can change chemically and/or physically - Grade 6	
a. Identify and classify changes in matter as chemical and/or physical	Types of Chemical Reactions
b. Identify chemical changes (i.e., rusting, oxidation, burning, decomposition by acids, decaying, baking) in common objects (i.e., rocks such as limestone, minerals, wood, steel wool, plants) as a result of interactions with sources of energy or other matter that form new substances with different characteristic properties	Types of Chemical Reactions Everyday Chemical Reactions
c. Identify physical changes in common objects (e.g., rocks, minerals, wood, water, steel wool, plants) and describe the processes which caused the change (e.g., weathering, erosion, cutting, dissolving)	Erosion, Transportation and Deposition Physical Weathering Biological Weathering Chemical Weathering
I. Mass is conserved during any physical or chemical change - Grade 6	
a. Demonstrate and provide evidence that mass is conserved during a physical change	Conservation of Mass
I. Mass is conserved during any physical or chemical change - Grade 7	
a. Explain that the amount of matter remains constant while being recycled through the water cycle	The Water Cycle
I. Mass is conserved during any physical or chemical change - Grade 8	
a. Provide evidence that mass is conserved during a chemical change in a closed system (e.g., vinegar + baking soda, mold growing in a closed container, steel wool rusting)	Conservation of Mass
b. Explain that the amount of matter remains constant while being recycled through the rock cycle	The Rock Cycle
c. Explain that the amount of matter remains constant while being recycled through food chains and food webs	Recycling Nutrients
2. Energy has a source, can be stored, and can be transferred but is conserved within a system	
A. Forms of energy have a source, a means of transfer (work and heat), and a receiver - Grade 6	
a. Identify sources of visible light (e.g., the Sun and other stars, flint, bulb, flames, lightning)	What is Light?
b. Describe evidence (i.e., cannot bend around walls) that visible light travels in a straight line, using the appropriate tools (i.e., pinhole viewer, ray box, laser pointer)	-
c. Compare the reflection of visible light by various surfaces (i.e., mirror, smooth and rough surfaces, shiny and dull surfaces, Moon)	Reflection
d. Compare the refraction of visible light passing through different transparent and translucent materials (e.g., prisms, water, a lens)	Refraction

e. Predict how different surfaces (transparent, translucent, opaque) and lenses (convex, concave) affect the behavior of visible light rays and the resulting image of an object	What is Light?
f. Identify receivers of visible light energy (e.g., eye, photocell)	What is Light?
g. Recognize and explain that an object is “seen” only when the object emits or reflects light to the eye	What is Light?
h. Recognize differences in wavelength and energy levels within that range of visible light that can be seen by the human eye are perceived as differences in color	Color
i. Describe how sound energy is transferred by wave-like disturbances that spread away from the source through a medium	What is Sound?
j. Describe how changes in energy cause changes in loudness and pitch of a sound	What is Sound?
k. Predict how the properties of the medium (e.g., air, water, empty space, rock) affect the speed of different types of mechanical waves (i.e., earthquake, sound)	Speed of Sound Earthquakes
A. Forms of energy have a source, a means of transfer (work and heat), and a receiver - Grade 7	
a. Identify thermal energy as the random motion (kinetic energy) of molecules or atoms within a substance	Heat and Temperature
b. Use the kinetic molecular model to explain changes in the temperature of a material	Heat and Temperature
c. Identify thermal energy is transferred as heat from warmer objects to cooler objects until both reach the same temperature (equilibrium)	Heat and Temperature Conduction and Convection
d. Identify the type of materials that transfer energy by conduction, convection, and/or radiation	Conduction and Convection Radiation
e. Describe how heat is transferred by conduction, convection, and radiation, and classify examples of each	Conduction and Convection Radiation
f. Classify common materials (e.g., wood, foam, plastic, glass, aluminum foil, soil, air, water) as conductors or insulators of thermal energy	Conduction and Convection
g. <i>Predict the differences in temperature over time on different colored (black and white) objects placed under the same heat source</i>	–
h. Describe the interactions (i.e., repel, attract) of like and unlike charges (i.e., magnetic, static electric, electrical)	Magnetic Materials Electromagnets
i. Diagram and identify a complete electric circuit by using a source (battery), means of transfer (wires), and receiver (resistance bulbs, motors, fans)	What Are Circuits? Energy Transfer in Circuits
j. Observe and describe the evidence of energy transfer in a closed series circuit	Energy Transfer in Circuits Series Circuits
k. Describe the effects of resistance (number of receivers), amount of voltage (number of energy sources), and kind of transfer materials on the current being transferred through a circuit (e.g., brightness of light, speed of motor)	Series Circuits Parallel Circuits

l. Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)	Metals and Nonmetals
m. Diagram and distinguish between complete series and parallel circuits	Series Circuits Parallel Circuits
n. Identify advantages and disadvantages of series and parallel circuits	Series Circuits Parallel Circuits
A. Forms of energy have a source, a means of transfer (work and heat), and a receiver - Grade 8	
a. Recognize and describe how chemical energy is stored in chemical compounds (e.g., energy stored in and released from food molecules, batteries, nitrogen explosives, fireworks, organic fuels)	What is Energy?
C. Electromagnetic energy from the Sun (solar radiation) is a major source of energy on Earth - Grade 6	
a. Recognize and describe how energy from the Sun is transferred to Earth in a range of wavelengths and energy levels, including visible light, infrared radiation, and ultraviolet radiation	Electromagnetic Waves What is Light? Radiation
b. Recognize and apply the fact that energy from the Sun is the source of almost all energy used to produce the food for living organisms	What is Photosynthesis? Feeding Types Plants as Food
C. Electromagnetic energy from the Sun (solar radiation) is a major source of energy on Earth - Grade 7	
a. Identify solar radiation as the primary source of energy for weather phenomena	What is Weather? Wind and Ocean Currents
F. Energy can be transferred within a system as the total amount of energy remains constant (i.e., Law of Conservation of Energy) - Grade 7	
a. Identify the different energy transformations that occur between different systems (e.g., chemical energy in battery converted to electricity in circuit converted to light and heat from a bulb)	How is Electrical Energy Useful?
b. Identify that, during an energy transformation, heat is often transferred from one object (system) to another because of a difference in temperature	How is Electrical Energy Useful? Energy Efficiency
c. Recognize and describe how energy is not lost but conserved as it is transferred and transformed	What is Energy?
F. Energy can be transferred within a system as the total amount of energy remains constant (i.e., Law of Conservation of Energy) - Grade 8	

a. Identify the evidence of different energy transformations (e.g., explosion of light, heat, and sound, temperature change, electrical charge) that may occur as chemical energy is released during a chemical reaction	What is Energy?
Strand 2: Properties and Principles of Force and Motion	
1. The motion of an object is described by its change in position relative to another object or point	
A. The motion of an object is described as a change in position, direction, and speed relative to another object (frame of reference) - Grade 7	
a. Describe the circular motion of a moving object as the result of a force acting toward the center	–
b. Classify different types of motion (e.g., straight line, projectile, circular, vibrational)	–
c. Given an object in motion, calculate its speed (distance/time)	Distance, Time and Speed
d. Interpret a line graph representing an object's motion in terms of distance over time (speed) using metric units	Graphing Speed
2. Forces affect motion	
A. Forces are classified as either contact forces (pushes, pulls, friction, buoyancy) or noncontact forces (gravity, magnetism), that can be described in terms of direction and magnitude - Grade 7	
a. Identify and describe the types of forces acting on an object in motion, at rest, floating/sinking (i.e., type of force, direction, amount of force in Newton's)	Calculating Resultant Forces What Are Forces?
b. Compare the forces acting on an object by using a spring scale to measure them to the nearest Newton	What Are Forces?
B. Every object exerts a gravitational force on every other object - Grade 7	
a. Explain every object exerts a gravitational force of attraction on every other object	Gravity
b. Recognize an object's weight is a measure of the gravitational force of a planet/moon acting on that object	Gravity
c. Compare the amount of gravitational force acting between objects (which is dependent upon their masses and the distance between them)	Gravity
D. Newton's Laws of Motion explain the interaction of mass and forces, and are used to predict changes in motion - Grade 7	
a. Compare the effects of balanced and unbalanced forces (including magnetic, gravity, friction, push or pull) on an object's motion	What Are Forces? Calculating Resultant Forces Friction Gravity Magnetic Materials

b. Explain that when forces (including magnetic, gravity, friction, push or pull) are balanced, objects are at rest or their motion remains constant	What Are Forces?
c. Explain that a change in motion is the result of an unbalanced force acting upon an object	What Are Forces?
d. <i>Explain how the acceleration of a moving object is affected by the amount of net force applied and the mass of the object</i>	–
F. Work transfers energy into and out of a mechanical system - Grade 7	
a. Recognize examples of work being done on an object (force applied and distance moved in the direction of the applied force) with and without the use of simple machines	Moments Moment Calculations
b. <i>Calculate the amount of work done when a force is applied to an object over a distance ($W = F \times d$)</i>	–
c. Explain how simple machines affect the amount of effort force, distance through which a force is applied, and/or direction of force while doing work	Moments Moment Calculations
d. <i>Recognize the amount of work output is never greater than the amount of work input, with or without the use of a simple machine</i>	–
e. <i>Evaluate simple machine designs to determine which design requires the least amount of effort force and explain why</i>	–
Strand 3: Characteristics and Interactions of Living Organisms	
1. There is a fundamental unity underlying the diversity of all living organisms	
A. Organisms have basic needs for survival - Grade 6	
a. Describe the common life processes necessary to the survival of organisms (i.e., growth, reproduction, life span, response to stimuli, energy use, exchange of gases, use of water, elimination of waste)	Animal and Plant Cells
A. Organisms have basic needs for survival - Grade 8	
a. Recognize that most plants and animals require food and oxygen (needed to release the energy from that food)	Releasing Energy
C. Cells are the fundamental units of structure and function of all living things - Grade 6	
a. Recognize all organisms are composed of cells, the fundamental units of life, which carry on all life processes	Animal and Plant Cells
D. Plants and animals have different structures that serve similar functions necessary for the survival of the organism - Grade 8	

a. Identify and contrast the structures of plants and animals that serve similar functions (e.g., taking in water and oxygen, support, response to stimuli, obtaining energy, circulation, digestion, excretion, reproduction)	Animal and Plant Cells Leaves and Glucose Roots and Water Digestion Respiration and the Circulatory System
E. Biological classifications are based on how organisms are related - Grade 6	
a. Recognize most of the organisms on Earth are unicellular (e.g., bacteria, protists) and other organisms, including humans, are multicellular	Animal and Plant Cells What Are Microbes?
b. Identify examples of unicellular (e.g., bacteria, some protists, fungi) and multicellular organisms (e.g., some fungi, plants, animals)	What Are Microbes?
2. Living organisms carry out life processes in order to survive	
A. The cell contains a set of structures called organelles that interact to carry out life processes through physical and chemical means - Grade 6	
a. Compare and contrast the following plant and animal cell structures: cell membrane, nucleus, cell wall, chloroplast, and cytoplasm	Animal and Plant Cells
b. Recognize the chloroplast as the cell structure where food is produced in plants and some unicellular organisms (e.g., algae, some protists)	Animal and Plant Cells What Are Microbes?
A. The cell contains a set of structures called organelles that interact to carry out life processes through physical and chemical means - Grade 8	
a. Describe how the cell membrane helps regulate the transfer of materials in and out of the cell	Animal and Plant Cells
b. Identify the function of the chloroplast during photosynthesis	What is Photosynthesis? Leaves and Glucose
B. Photosynthesis and cellular respiration are complementary processes necessary to the survival of most organisms on Earth - Grade 6	
a. Describe how plants use energy from the Sun to produce food and oxygen through the process of photosynthesis	What is Photosynthesis?
B. Photosynthesis and cellular respiration are complementary processes necessary to the survival of most organisms on Earth - Grade 8	
a. Describe photosynthesis is a chemical change with reactants (water and carbon dioxide) and products (energy-rich sugar molecules and oxygen) that takes place in the presence of light and chlorophyll	What is Photosynthesis?
b. Describe how oxygen is needed by all cells of most organisms for the release of energy from nutrient (sugar) molecules	Releasing Energy

c. Describe the importance of the transport and exchange of oxygen and carbon dioxide to the survival of the organism	Releasing Energy
C. Complex multicellular organisms have systems that interact to carry out life processes through physical and chemical means - Grade 8	
a. Identify and give examples of each level of organization (cell, tissue, organ, organ system) in multicellular organisms (plants, animals)	Cells to Organisms
b. Illustrate and explain the path water and nutrients take as they move through the transport system of a plant	Roots and Water
c. Explain the interactions between the circulatory and digestive systems as nutrients are processed by the digestive system, passed into the blood stream, and transported in and out of the cell	Digestion Chemical Digestion Respiration and the Circulatory System
d. Compare and contrast the processes of mechanical and chemical digestion, and their role in providing materials necessary for survival of the cell and organism	Chemical Digestion Digestion
e. Identify the importance of the transport and exchange of nutrient and waste molecules to the survival of the cell and organism	Digestion Respiration and the Circulatory System
f. Explain the interactions between the circulatory and respiratory systems in exchanging oxygen and carbon dioxide between cells and the atmosphere (when oxygen enters the body, passes into the blood stream, and is transported into the cell; carbon dioxide is transported out of the cell, passes into the blood stream, and exits the body)	Respiration and the Circulatory System The Respiratory System
g. Explain the interactions between the nervous and muscular systems when an organism responds to a stimulus	The Nervous System Human Behavior Animal Behavior The Musculoskeletal System
F. Cellular activities and responses can maintain stability internally while external conditions are changing (homeostasis) - Grade 8	
a. Predict the response the body may take to maintain internal balance during an environmental change (e.g., shivering when cold, slowing metabolism when food supply decreases or when dehydrated, adrenaline rush when frightened)	Human Behavior Animal Behavior Types of Animal Behavior
G. Life processes can be disrupted by disease (intrinsic failures of the organ systems or by infection due to other organisms) - Grade 8	
a. Explain the cause and effect of diseases (e.g., AIDS, cancer, diabetes, hypertension) on the human body (locally assessed)	Fighting Disease
b. Relate some common diseases (i.e., cold, influenza, strep throat, dysentery, fungal infections) to the organisms that cause them (bacteria, viruses, protists, fungi)	How Microbes Cause Disease

c. Differentiate between infectious and noninfectious diseases	–
d. Explain the role of antibiotics and vaccines in the treatment and prevention of diseases	Fighting Disease
3. There is a genetic basis for the transfer of biological characteristics from one generation to the next through reproductive processes	
A. Reproduction can occur asexually or sexually - Grade 8	
a. Compare and contrast the processes of asexual and sexual reproduction, including the type and number of cells involved (one body cell in asexual, two sex cells in sexual), and the number of gene sets (body cell has two sets, sex cells have one set each) passed from parent(s) to offspring	Types of Reproduction Causes of Variation
b. Identify examples of asexual reproduction (i.e., plants budding, binary fission of single cell organisms)	Types of Reproduction
c. Compare and contrast the reproductive mechanisms of classes of vertebrates (i.e., internal vs. external fertilization)	Human Sex Cells and System
d. Describe how flowering plants reproduce sexually	–
C. Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to daughter cells and from parent to offspring during reproduction - Grade 8	
a. Identify chromosomes as cellular structures that occur in pairs that carry hereditary information in units called genes	Genes and Alleles
b. Recognize and describe how when asexual reproduction occurs, the same genetic information found in the parent cell is copied and passed on to each new daughter cell (Assess only the concept – not the term or process of mitosis)	Types of Reproduction
c. Recognize and describe how when sexual reproduction occurs, genetic material from both parents is passed on and combined to form the genetic code for the new organism (Assess only the concept – not the term or process of meiosis)	Causes of Variation Genes and Alleles Inheritance Types of Reproduction
D. There is heritable variation within every species of organism - Grade 8	
a. Recognize and describe when asexual reproduction occurs, the daughter cell is identical to the parent cell (assuming no change in the parent genes)	Types of Reproduction
b. Recognize and describe when sexual reproduction occurs, the offspring is not identical to either parent due to the combining of the different genetic codes contained in each sex cell	Causes of Variation Genes and Alleles Inheritance Types of Reproduction
Strand 4: Changes in Ecosystems and Interactions of Organisms with their Environments	
1. Organisms are interdependent with one another and with their environment	

A. All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem - Grade 6	
a. Identify the biotic factors (populations of organisms) and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition) that make up an ecosystem	Habitats
B. Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite - Grade 6	
a. Identify populations within a community that are in competition with one another for resources	Competition
b. Identify the factors that affect the number and types of organisms an ecosystem can support (e.g., food availability, abiotic factors such as quantity of light and water, temperature and temperature range, soil composition, disease, competitions from other organisms, predation)	Competition
c. Predict the possible effects of changes in the number and types of organisms in an ecosystem on the populations of other organisms within that ecosystem	Food Webs Feeding Types Competition
D. The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes - Grade 6	
a. Describe beneficial and harmful activities of organisms, including humans (e.g., deforestation, overpopulation, water and air pollution, global warming, restoration of natural environments, river bank/coastal stabilization, recycling, channelization, reintroduction of species, depletion of resources), and explain how these activities affect organisms within an ecosystem	Greenhouse Gases Acid Rain Environmental Change
b. Predict the impact (beneficial or harmful) of a natural environmental change (e.g., forest fire, flood, volcanic eruption, avalanche) on the organisms in an ecosystem	Weather Hazards
c. <i>Describe possible solutions to potentially harmful environmental changes within an ecosystem</i>	–
D. The diversity of species within an ecosystem is affected by changes in the environment, which can be caused by other organisms or outside processes - Grade 8	
a. Explain the beneficial or detrimental impact that some organisms (i.e., viruses, bacteria, protists, fungi) may have on other organisms (e.g., diseases, antibiotics, breakdown of waste, fermentation)	How Microbes Cause Disease Uses of Microbes Recycling Nutrients
2. Matter and energy flow through an ecosystem	

A. As energy flows through the ecosystem, all organisms capture a portion of that energy and transform it to a form they can use - Grade 6	
a. Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships	Feeding Types Food Chains Food Webs
b. Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem	Feeding Types
B. Matter is recycled through an ecosystem - Grade 8	
a. Illustrate the oxygen/carbon dioxide cycles (including the processes of photosynthesis and cellular respiration)	What is Photosynthesis? Releasing Energy Recycling Nutrients
b. Describe the processes involved in the recycling of matter in the oxygen/carbon dioxide cycles	Recycling Nutrients Respiration and the Circulatory System
3. Genetic variation sorted by the natural selection process explains evidence of biological evolution	
A. Evidence for the nature and rates of evolution can be found in anatomical and molecular characteristics of organisms and in the fossil record - Grade 6	
a. Identify fossils as evidence some types of organisms (e.g., dinosaurs, trilobites, mammoths, giant tree ferns) that once lived in the past, and have since become extinct, have similarities with and differences from organisms living today	Evolution
C. Natural selection is the process of sorting individuals based on their ability to survive and reproduce within their ecosystem - Grade 6	
a. Relate examples of adaptations (specialized structures or behaviors) within a species to its ability to survive in a specific environment (e.g., hollow bones/flight, hollow hair/insulation, dense root structure/compact soil, seeds/food, protection for plant embryo vs. spores, fins/movement in water)	Adaptations Animal Behavior
b. Predict how certain adaptations, such as behavior, body structure, or coloration, may offer a survival advantage to an organism in a particular environment	Adaptations Evolution
Strand 5: Processes and Interactions of the Earth's Systems (Geosphere, Atmosphere, and Hydrosphere)	
1. Earth's systems (geosphere, atmosphere, and hydrosphere) have common components and unique structures	
A. The Earth's crust is composed of various materials, including soil, minerals, and rocks, with characteristic properties - Grade 6	

a. Describe the components of soil and other factors that influence soil texture, fertility, and resistance to erosion (e.g., plant roots and debris, bacteria, fungi, worms, rodents)	Soil
A. The Earth's crust is composed of various materials, including soil, minerals, and rocks, with characteristic properties - Grade 8	
a. Differentiate between minerals and rocks (which are composed of different kinds of minerals)	–
b. Describe the distinguishing properties that can be used to classify minerals (i.e., texture, smell, luster, hardness, crystal shape, streak, reaction to magnets and acids)	–
c. Describe the methods used to identify the distinguishing properties of minerals Classify rocks as sedimentary, igneous, or metamorphic	Different Types of Rocks Igneous Rocks Metamorphic Rocks Sedimentary Rocks
B.The hydrosphere is composed of water (a material with unique properties), gases, and other materials - Grade 6	
a. Identify and describe the properties of water that make it an essential component of the Earth system (e.g., its ability to act as a solvent, its ability to remain as a liquid at most Earth temperatures)	The Water Cycle
C. The atmosphere (air) is composed of a mixture of gases, including water vapor, and minute particles - Grade 7	
a. Describe the composition of the Earth's atmosphere (i.e., mixture of gases, water and minute particles) and how it circulates as air masses	The Atmosphere What is Weather? Wind and Ocean Currents
b. Describe the role atmosphere (e.g., clouds, ozone) plays in precipitation, reflecting and filtering light from the Sun, and trapping heat energy emitted from the Earth's surface	The Atmosphere
2. Earth's Systems (geosphere, atmosphere, and hydrosphere) interact with one another as they undergo change by common processes	
A. The Earth's materials and surface features are changed through a variety of external processes - Grade 6	
a. Make inferences about the formation of sedimentary rocks from their physical properties (e.g., layering and the presence of fossils indicate sedimentation)	Sedimentary Rocks
b. Explain how the formation of sedimentary rocks depends on weathering and erosion	Sedimentary Rocks The Rock Cycle

c. Describe how weathering agents and erosional processes (i.e., force of water as it freezes or flows, expansion/contraction due to temperature, force of wind, force of plant roots, action of gravity, chemical decomposition) slowly cause surface changes that create and/or change landforms	Physical Weathering Chemical Weathering Biological Weathering Erosion, Transportation and Deposition
d. Describe how the Earth's surface and surface materials can change abruptly through the activity of floods, rock/mudslides, or volcanoes	Igneous Rocks
B. There are internal processes and sources of energy within the geosphere that cause changes in Earth's crustal plates - Grade 6	
a. Identify events (earthquakes, volcanic eruptions) and the landforms created by them on the Earth's surface that occur at different plate boundaries	Plate Boundaries Earthquakes
B. There are internal processes and sources of energy within the geosphere that cause changes in Earth's crustal plates - Grade 8	
a. Explain convection currents are the result of uneven heating inside the mantle resulting in the melting of rock materials, convection of magma, eruption/flow of magma, and movement of crustal plates	The Structure of the Earth What is Plate Tectonics?
b. Explain how rock layers are affected by the folding, breaking, and uplifting of rock layers due to plate motion	What is Plate Tectonics? Plate Boundaries
c. Describe how the movement of crustal plates can cause earthquakes and volcanic eruptions that can result in mountain building and trench formation	Plate Boundaries Earthquakes
C. Continual changes in Earth's materials and surface that result from internal and external processes are described by the rock cycle - Grade 8	
a. Explain how heating and cooling in the mantle layer leads to the formation of metamorphic rocks and some igneous rocks	Metamorphic Rocks Igneous Rocks
b. Make inferences about the formation of igneous and metamorphic rocks from their physical properties (e.g., crystal size indicates rate of cooling, air pockets or glassy texture indicate volcanic activity)	Metamorphic Rocks Igneous Rocks
c. Explain and diagram the external and internal processes of the rock cycle (e.g., weathering and erosion, sedimentation, compaction, heating, recrystallization, resurfacing due to forces that drive plate motion)	The Rock Cycle Erosion, Transportation and Deposition Chemical Weathering Physical Weathering Biological Weathering
D. Changes in the Earth over time can be inferred through rock and fossil evidence - Grade 6	

a. Explain the types of fossils and the processes by which they are formed (i.e., replacement, mold and cast, preservation, trace)	–
b. Use fossil evidence to make inferences about changes on Earth and in its environment (i.e., superposition of rock layers, similarities between fossils in different geographical locations, fossils of seashells indicate the area was once underwater)	–
D. Changes in the Earth over time can be inferred through rock and fossil evidence - Grade 8	
a. Describe the methods used to estimate geologic time and the age of the Earth (e.g., techniques used to date rocks and rock layers, presence of fossils)	–
b. Use rock and fossil evidence to make inferences about the age, history, and changing life forms and environment of the Earth (i.e., changes in successive layers of sedimentary rock and the fossils contained within them, similarities between fossils in different geographic locations, similarities between fossils and organisms present today, fossils of organisms indicating changes in climate, fossils of extinct organisms)	–
E. Changes in the form of water as it moves through Earth's systems are described as the water cycle - Grade 7	
a. Explain and trace the possible paths of water through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run-off/ groundwater flow)	The Water Cycle
b. Relate the different forms water can take (i.e., snow, rain, sleet, fog, clouds, dew, humidity) as it moves through the water cycle to atmospheric conditions (i.e., temperature, pressure, wind direction and speed, humidity) at a given geographic location	–
c. Explain how thermal energy is transferred throughout the water cycle by the processes of convection, conduction, and radiation	Conduction and Convection Radiation The Water Cycle
F. Climate is a description of average weather conditions in a given area due to the transfer of energy and matter through Earth's systems - Grade 7	
a. Explain how the differences in surface temperature, due to the different heating and cooling rates of water and soil, affect the temperature and movement of the air above	Wind and Ocean Currents
b. Describe the characteristics of air masses (i.e., high/low barometric pressure, temperature) and predict their effect on the weather in a given location	What is Weather?
c. Identify weather conditions associated with cold fronts and warm fronts	What is Weather?
d. Identify factors that affect weather patterns in a particular region (e.g., proximity to large bodies of water, latitude, altitude, prevailing wind currents, amount of solar radiation, location with respect to mountain ranges)	Wind and Ocean Currents

e. Collect and interpret weather data (e.g., cloud cover, precipitation, wind speed and direction) from weather instruments and maps to explain present day weather and to predict the next day's weather	-
f. Describe the significant changes in temperature and barometric pressure may cause dramatic weather phenomena (i.e., severe thunderstorms, tornadoes, hurricanes)	Hurricanes What is Weather? Tornados
g. Differentiate between weather and climate.	Climate Zones
h. Identify factors that affect climate (e.g., latitude, altitude, prevailing wind currents, amount of solar radiation)	What is Weather?
3. Human activity is dependent upon and affects Earth's resources and systems	
A. Earth's materials are limited natural resources affected by human activity - Grade 6	
a. Relate the comparative amounts of fresh water and salt water on the Earth to the availability of water as a resource for living organisms and human activity	-
b. Describe the affect of human activities (e.g., landfills, use of fertilizers and herbicides, farming, septic systems) on the quality of water	Acid Rain Growing Plants
c. Analyze the ways humans affect the erosion and deposition of soil and rock materials (e.g., clearing of land, planting vegetation, paving land, construction of new buildings, building or removal of dams) and propose possible solutions.	Flooding
A. Earth's materials are limited natural resources affected by human activity - Grade 7	
a. Distinguish between renewable (e.g., geothermal, hydroelectric) and nonrenewable (e.g., fossil fuel) energy sources	Renewable Energy Nonrenewable Energy Resources
b. Provide examples of how the availability of fresh water for humans and other living organisms is dependent upon the water cycle	-
Strand 6: Composition and Structure of the Universe and the Motion of the Objects Within It	
1. The universe has observable properties and structure	
A. The Earth, Sun, and Moon are part of a larger system that includes other planets and smaller celestial bodies - Grade 7	
a. Classify celestial bodies in the solar system into categories: Sun, Moon, planets, and other small bodies (i.e., asteroids, comets, meteors), based on physical properties	The Solar System
b. Compare and contrast the size, composition, atmosphere, and surface of the planets (inner vs. outer) in our solar system and Earth's moon	The Solar System
c. Describe the relative proximity of common celestial bodies (i.e., Sun, Moon, planets, smaller celestial bodies such as comets and meteors, other stars) in the sky to the Earth	-

B. The Earth has a composition and location suitable to sustain life - Grade 7	
a. Describe how the Earth's placement in the solar system is favorable to sustain life (i.e., distance from the Sun, temperature, atmosphere)	The Atmosphere The Solar System
b. Compare and contrast the characteristics of Earth that support life with the characteristics of other planets that are considered favorable or unfavorable to life (e.g., atmospheric gases, extremely high/low temperatures)	The Solar System
C. Most of the information we know about the universe comes from the electromagnetic spectrum - Grade 7	
a. Explain that stars are separated from one another by vast and different distances, which causes stars to appear smaller than the Sun	The Solar System
<i>b. Compare the distance light travels from the Sun to Earth to the distance light travels from other stars to Earth using light years</i>	–
2. Regular and predictable motions of objects in the universe can be described and explained as the result of gravitational forces	
A. The apparent position of the Sun and other stars, as seen from Earth, change in observable patterns - Grade 7	
a. Relate the apparent east-to-west changes in the positions of the Sun, other stars, and planets in the sky over the course of a day to Earth's counterclockwise rotation about its axis	Days, Years and Seasons
b. Describe the pattern that can be observed in the changes in number of hours of visible sunlight, and the time and location of sunrise and sunset, throughout the year	Days, Years and Seasons
c. Describe how, in the Northern Hemisphere, the Sun appears lower in the sky during the winter and higher in the sky during the summer	Days, Years and Seasons
d. Describe how, in winter, the Sun appears to rise in the Southeast and set in the Southwest, accounting for a relatively short day length, and, in summer, the Sun appears to rise in the Northeast and set in the Northwest, accounting for a relatively long day length	Days, Years and Seasons
<i>e. Describe how the Sun is never directly overhead when observed from North America</i>	–
B. The apparent position of the Moon, as seen from Earth, and its actual position relative to Earth change in observable patterns - Grade 7	
a. Observe the change in time and location of Moon rise, Moon set, and the Moon's appearance relative to time of day and month over several months, and note the pattern in this change	The Earth, Moon and Sun
<i>b. Describe how the Moon rises later each day due to its revolution around the Earth in a counterclockwise direction</i>	–
<i>c. Describe how the Moon is in the sky for roughly 12 hours in a 24-hour period (i.e., if the Moon rises at about 6 P.M., it will set at about 6 A.M.)</i>	–

d. Describe how that one half of the Moon is always facing the Sun and, therefore, one half of the Moon is always lit	The Earth, Moon and Sun
e. <i>Relate the apparent change in the Moon's position in the sky as it appears to move east-to-west over the course of a day to Earth's counterclockwise rotation about its axis</i>	–
f. Describe how the appearance of the Moon that can be seen from Earth changes approximately every 28 days in an observable pattern (moon phases)	The Earth, Moon and Sun
C. The regular and predictable motions of a planet and moon relative to the Sun explain natural phenomena on a planet, such as day, month, year, shadows, moon phases, eclipses, tides, and seasons - Grade 7	
a. Illustrate and explain a day as the time it takes a planet to make a full rotation about its axis	Days, Years and Seasons
b. Diagram the path (orbital ellipse) the Earth travels as it revolves around the Sun	Days, Years and Seasons
c. Illustrate and explain a year as the time it takes a planet to revolve around the Sun	Days, Years and Seasons
d. Explain the relationships between a planet's length of year (period of revolution) and its position in the solar system	The Solar System Days, Years and Seasons
e. Recognize and explain the phases of the moon are due to the relative positions of the Moon with respect to the Earth and Sun	The Earth, Moon and Sun
f. Relate the axial tilt and orbital position of the Earth as it revolves around the Sun to the intensity of sunlight falling on different parts of the Earth during different seasons	Days, Years and Seasons
D. Gravity is a force of attraction between objects in the solar system that governs their motion - Grade 7	
a. Describe how the Earth's gravity pulls any object on or near the Earth toward it (including natural and artificial satellites)	Gravity Satellites
b. Describe how the planets' gravitational pull keeps satellites and moons in orbit around them	Gravity Satellites
c. Describe how the Sun's gravitational pull holds the Earth and other planets in their orbits	Gravity