6th Grade Science Curriculum Map				
Time	**Strands**	**Standards**	**Student Learning Targets "I Can" Statements**	**Assessments**
2 Weeks	**Life Science (LS) Cellular to Multicellular**	Cells are the fundamental unit of life. All living things are composed of cells. Different body tissues and organs are made of different kinds of cells. The ways cells function are similar in all living organisms. **Note 1:** Specific information about the organelles that need to be addressed at this grade level will be found in the model curriculum. **Note 2:** Emphasis should be placed on the function and coordination of these components, as well as on their roles in overall cell function.	"I Can"… Explain how the invention of the microscope contributed to scientists' understanding of living things. State the three points of the cell theory.	Be able to: Answer critical questions Observational data based on class participation Tests/Quizzes/ Homework Various lab activities using microscopes and slides

The content statements for sixth-grade Life Science are each partial components of a large concept. The parts have been isolated to call attention to the depth of knowledge required to build to one of biology's foundational theories, Modern Cell Theory. It is recommended that the content statements be combined and taught as a whole. For example, the energy needs of cells can be interwoven with the function of mitochondria. Modern Cell Theory states that all living things are made of cells. Cells are the basic unit of structure and function of all living things. Many organisms are single-celled and that one cell must carry out all the basic functions of life. Other organisms are multicellular and the cells that form these organisms can be organized at various levels to carry out all the basic functions of life. Different body tissues and organs can be made up of different kinds of cells. The cells in similar tissues and organs in animals are similar. The tissues and organs found in plants differ slightly from similar tissues in animals. Use Modern Cell Theory to exemplify how scientific theories are developed over time.

Microscopes, micrographs, safety procedures, models and illustrations must be used to observe cells from many different types of organisms. Representative cells from eubacteria (cynaobacteria), protista (algae, amoeba, diatoms, euglena, volvox) and fungi (common mushrooms, bread molds) must be observed for cell structures such as the cell wall, cell membrane and nucleus. Plantae cells (mosses, ferns and angiosperms) must

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be observed for the following cell components: nucleus, mitochondria, chloroplast, ribosome, plasma membrane, vacuole and lysosome. Mitochondria and ribosomes are not visible under regular light microscopes but may be viewed using micrographs or illustrations. The differences in sizes and shape of various cells and organelles must be noted. Size is a useful tool in identification of cells. The relationship between structure and function is a crosscutting theme for science and should be explored when investigating the structure and function of cellular organelles. Emphasis must be placed on the function and coordination of these components, as well as on the overall cell function, before introducing and reinforcing the names of these components (e.g., plant and algae cells contain plastids where the manufacture and storage of chemical compounds important to the cell occur). The most commonly described plastids are chloroplasts in green plant cells.
Microscopes must be used to view a variety of cells (see above), tissues (xylem, phloem, connective, muscle, nervous) and organs (leaf, stem, flower, spore, ganglia, blood vessels, eyes) to compare and contrast their similarities and differences.
Real-world applications, new technology and contemporary science must be used in this content (e.g., the presence of microbes in potable water can be a way to connect the solutions to real-world problems and biology).

3-4 Weeks	**Life Science (LS) Cellular to Multicellular**	All cells come from pre-existing cells. Cells repeatedly divide resulting in more cells and growth and repair in multicellular organisms. **Note:** This is not a detailed discussion of the phases of mitosis or meiosis. The focus should be on reproduction as a means of transmitting genetic information from one generation to the next, cellular growth and repair.	"I Can"… List the events that take place during the three stages of the cell cycle. Describe the structure of DNA and how DNA replication occurs. Describe the results of Mendel's experiments including probability; and identify what controls the inheritance of traits in organisms. Identify what controls the inheritance of traits in organisms. Identify the events that occur during meiosis. Explain the relationship between chromosomes and genes, and the role chromosomes play in inheritance.	Be able to: Answer critical questions Observational data based on class participation Tests/Quizzes/ Homework Mitosis student models Yarn activity for cell division Cell cycle sketch design with stages Punnett square problems Dragon Genetics DNA K-Nex

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The content statements for sixth-grade life science are each partial components of a larger concept. The parts have been isolated to call attention to the depth of knowledge required to build to one of biology's important foundational theories: Modern Cell Theory. It is recommended that the content statements be combined and taught as a whole.

Modern Cell Theory states that cells come from pre-existing cells. Individual organisms do not live forever therefore reproduction is necessary for the continuation of every species. Traits are passed onto the next generation through reproduction. In single-celled organisms, the process of binary fission produces a new organism. In multicellular organisms, cells multiply for growth and repair.

In this grade, mitosis is explored. All cells contain genetic materials. The genetic material must be described as chromosomes. The chemicals and chemical processes associated with the genetic material are reserved for high school biology. Chromosomes must be described as structures in cells that contain the genetic material. Microscopes, micrographs, models and illustrations can be used to observe cells from different organisms in the process of dividing. It is not appropriate to learn the names of the stages of mitosis. The focus is on observing cells dividing as evidence that cells come from pre-existing cells and genetic material is transmitted from parent cell to daughter cells.

The misconception of spontaneous generation can be included in discussions on this topic. The experiments of Redi and Pasteur can be used to explain how evidence can lead to new knowledge, better explanations and spur new technology.

5 Weeks	**Life Science (LS) Cellular to Multicellular**	Cells carry on specific functions that sustain life. Many basic functions of organisms occur in cells. Cells take in nutrients and energy to perform work, like making various molecules required by that cell or an organism. Every cell is covered by a membrane that controls what can enter and leave the cell. Within the cell are specialized parts for the transport of materials, energy capture and	"I Can"… Identify the role of the cell membrane and nucleus in the cell. Describe the functions performed by the other organelles of the cell. Describe the three methods by which materials move into and out of cells. Compare passive and active transport. Describe the process of photosynthesis. Describe the events that occur during respiration. Describe the relationship between photosynthesis and respiration.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes/ Homework Various lab activities with microscopes and slides Model/poster of animal/plant cell Shrinky Dinky Cells Plant/animal cell student models Build a model of a flowering plant

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Time	**Strands**	**Standards**	**Student Learning Targets "I Can" Statements**	**Assessments**
		release, protein building, waste disposal, information feedback and movement. **Note:** Emphasis should be placed on the function and coordination of cell components, as well as on their roles in overall cell function.		Plants of a plant cling manipulative

The content statements for sixth-grade life science are each partial components of a larger concept. The parts have been isolated to call attention to the depth of knowledge required to build to one of biology's important foundational theories: Modern Cell Theory. In classrooms, it is recommended that the content statements be combined and taught as a whole (e.g., the energy requirements of cells can be interwoven with the function of mitochondria). Cells have particular structures that are related to their functions. These functions are regulated and controlled (e.g., a cell membrane controls what can enter and leave the cell).
The organization of living systems includes explanation of the role of cells, tissues, organs and organ systems that carry out life functions for organisms. These roles include maintaining homeostasis, gas exchange, energy transfers and transformation, transportation of molecules, disposal of wastes and synthesis of new molecules. Connections are to be made between cellular organelles and processes.
Explore (3-D or virtually) conditions that optimize and/or minimize cellular function in a cell or an organism. Technology also can be used to run simulations to investigate specific outcomes and develop predictions about changes in functions.

1 Week	**Life Science (LS) Cellular to Multicellular**	Living systems at all levels of organization demonstrate the complementary nature of structure and function. The level of organization within organisms includes cells, tissues, organs, organ systems and whole organisms. Whether the	"I Can"… Describe the role of specialized cells in many-celled organisms.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes/ Homework Various lab activities with microscopes and slides

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Time	**Strands**	**Standards**	**Student Learning Targets "I Can" Statements**	**Assessments**
		organism is single-celled or multicellular, all of its parts function as a whole to perform the tasks necessary for the survival of the organism. Organisms have diverse body plans, symmetry and internal structures that contribute to their being able to survive in their environments.		

The content statements for sixth-grade life science are each partial components of a larger concept. The parts have been isolated to call attention to the depth of knowledge required to build to one of biology's important foundational theories: Modern Cell Theory. It is recommended that the content statements be combined and taught as a whole (e.g., levels of organization can be interwoven with the concept of cells as the fundamental unit of life).

Cells perform specialized functions in multicellular organisms. Groups of specialized cells form a tissue such as muscle. Different tissues are, in turn, grouped together to form larger functional units, called organs. Each type of cell, tissue and organ has a distinct structure and set of functions that serve the organism as a whole.

Organisms have diverse body plans, symmetry and internal structures. General distinctions among organisms (e.g., body plans, symmetry, internal structures) that support classifying them into a scientifically based system (a distinction of this grade level from Pre-K to 5) are explored. Organisms sorted into groups share similarities in external structures, internal structures and processes.

The commonality of life can be investigated through observing tissues, organs, cell structures (see limits in previous content statements), systems and symmetry (an approximate balanced distribution of duplicate body parts) for plants and animals.

Part of the exploration of the commonality of living systems can include comparison of cells, types of tissues, organs and organ systems between organisms (see other grade 6 content statements for details).

Inquiry and mathematical relationships should be drawn between cell size and the cell's ability to transport necessary materials into its interior. This link is critical for laying the foundation for the cell cycle in the grade 8.

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Time	**Strands**	**Standards**	**Student Learning Targets "I Can" Statements**	**Assessments**
4 Weeks	**Earth and Space Science (ESS) Rocks, Minerals and Soil**	Minerals have specific, quantifiable properties. Minerals are naturally occurring, inorganic solids that have a defined chemical composition. Minerals have properties that can be observed and measured. Minerals form in specific environments.	"I Can"… Identify the characteristics of a mineral. Identify the properties of a mineral, and explain how minerals are identified. Describe the processes by which minerals form.	Be able to: Answer critical questions Observational data based on class participation Tests/Quizzes/ Homework Lab activities Growing crystals, 3-D crystal nets Lab activities Identifying a mineral from a sample Mineral research brochure

Most rocks are composed of one or more minerals. Minerals have specific properties that can be used for identification. The properties that can be used for testing minerals include luster, hardness, cleavage, streak, magnetism, fluorescence and/or crystal shape. The emphasis is on learning how to identify the mineral by conducting tests (not through memorization). Common minerals (including those on Mohs' hardness scale) must be used in the identification process. A representative sample of minerals can be used so that different testing methods can be applied and demonstrated. Appropriate tools and safety procedures must be used to test mineral properties. Technology can provide identification information and research materials to assist in mineral investigations.
Minerals present in rocks can help identify the rocks correctly. Minerals can indicate the type of environment in which the rock and/or mineral formed. Some minerals (e.g., halite, varieties of gypsum) form through evaporation and some (e.g., calcite) form through a variety of chemical processes. Other minerals (e.g., feldspar varieties, magnetite, varieties of quartz) form in an igneous environment and some minerals (e.g., epidote) form in a metamorphic environment.

4 Weeks	**Earth and Space Science (ESS)**	Igneous, metamorphic and	List the characteristics used to identify rocks.	Be able to: Answer critical

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	Rocks, Minerals and Soil	sedimentary rocks have unique characteristics that can be used for identification and/or classification. Most rocks are composed of one or more minerals, but there are a few types of sedimentary rocks that contain organic material, such as coal. The composition of the rock, types of mineral present, mineral arrangement, and/or mineral shape and size can be used to identify the rock and to interpret its history of formation, breakdown (weathering) and transport (erosion).	Identify and describe the three major groups of rocks. Identify the characteristics used to classify igneous rocks, List and describe the three major types of sedimentary rocks. Identify the ways in which geologists classify metamorphic rocks.	questions Observational data based on class participation Tests/Quizzes/ Homework Lab activity Create a rock finders journal Lab activity Identifying a rock from a sample

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Rock identification and classification must be experiential and investigative. Common samples to use in identification should be representative of each type of rock. Igneous samples must include varieties of granite, rhyolite, basalt, obsidian, pumice and andesite. Metamorphic samples must include varieties of schist, gneiss, slate, marble, anthracite and phyllite. Sedimentary samples must include varieties of limestone, sandstone, shale, conglomerate and breccia. Other rock samples such as bituminous coal, coquina and chert must be included in identification investigations, but these may not always fall neatly into one specific rock category. Proper safety protocol and testing procedures must be used.
It is important to use the identification of the minerals, mineral arrangement (within the rock) and quantifiable characteristics of the rock to identify the rock. Analysis of specific rock characteristics can be conducted in the classroom or in nature with rock samples. Technology can be used to research current identification methods and techniques and assist in methods of determining the quantifiable characteristics of specific rocks.
The purpose of rock identification must be related to understanding the environment in which the rock formed.

2 Weeks	**Earth and Space Science (ESS) Rocks, Minerals and Soil**	Igneous, metamorphic, and sedimentary rocks form in different ways. Magma or lava cools and crystallizes to form igneous rocks. Heat and pressure applied to existing rock forms metamorphic rocks. Sedimentary rock forms as existing rock weathers chemically and/or physically and the weathered material is	"I Can"… Describe how sedimentary rocks form. Describe the conditions under which metamorphic rocks form. Describe the rock cycle. Explain the role played by plate tectonics in the rock cycle.	Be able to: Answer critical questions Observational data based on class participation Tests/Quizzes Homework Lab activity Rock cycle student lab Lab activity Edible rocks

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		compressed and then lithifies. Each rock type can provide information about the environment in which it was formed.		

Rocks and minerals in rocks form in specific types of environments. The rock cycle can be used for a general explanation of the conditions required for igneous, metamorphic and sedimentary rocks to form, but additional information should be added for relevancy. For example, the typical pattern of coal formation is an important connection to energy in Ohio and should be included. Another example would be the formation of Ohio sandstone and limestone indicating that a shallow sea once covered Ohio. Ohio's geologic history and past environmental conditions play an important role in understanding the existing bedrock in Ohio.
Conducting field investigations, taking field trips, geologic maps, virtual field trips, physical maps and topographic maps can be used to illustrate how types of geologic structures and features help identify the types of rock that may be found in specific areas. This must be connected to an understanding about the environmental conditions that needed to exist during the formation.

Included in other sections about minerals and rocks.	**Earth and Space Science (ESS) Rocks, Minerals and Soil**	Rocks, minerals and soils have common and practical uses. Nearly all manufactured material requires some kind of geologic resource. Most geologic resources are considered nonrenewable. Rocks, minerals and soil are examples of geologic resources that are nonrenewable. **Note:**	"I Can"… Describe how minerals, rocks, and soil are used.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes Homework Mineral research brochure Lab activity Create a rock finders journal

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		Nonrenewable energy sources should be included (such as fossil fuels).		

Rocks, minerals and soils have specific physical properties that determine how they can be used. The different methods of extracting the resources should be included. Uses of the resources should include construction (e.g., gypsum, metals, gravel, sand, lime, clay), energy (e.g., fossil fuels, radioactive materials), transportation (e.g., road salt, asphalt), agriculture (e.g., lime, peat, minerals for fertilizers, pesticides), domestic use (e.g., metals and gems for jewelry, clay for pottery or sculpting, natural dyes for clothing or paint) and technology (e.g., lithium, silica).
The conservation of resources through the management of the resources, which includes extraction methods, use, storage and disposal, is an important part of understanding the uses of rocks, minerals and soil.

2 Weeks	**Earth and Space Science (ESS) Rocks, Minerals and Soil**	Soil is unconsolidated material that contains nutrient matter and weathered rock. Soil formation occurs at different rates and is based on environmental conditions, types of existing bedrock and rates of weathering. Soil forms in layers known as horizons. Soil horizons can be distinguished from one another based on properties that can be measured.	"I Can"… Describe the composition of soil and explain how it forms. Explain how scientists classify soils. Identify the roles of plants and animals in soil formation.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes/ Homework Lab activity Comparing Soils Lab activity Which Soil is Better for Plants? Project Making the Model Soil Layers Scroll

Soil sampling and testing must be used to investigate soil. Soil forms at different rates and has different measurable properties, depending on the environmental conditions. Properties in soil that are useful in soil identification include texture, color, composition, permeability and porosity. Uses of soil depend upon their properties. For example, some soils may be recommended for agriculture, while others may be used for brick making or creating a pond.
Observing and identifying soil horizons are based upon understanding the different properties of soil and when

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the properties change. Soil sampling testing methods and equipment are included within this content statement. Soil maps (paper or digital) combined with geologic, aerial or topographic maps can assist in local identification of soil formations. A connection must be made to environmental conditions, types of bedrock and soil properties.
Appropriate tools and safety procedures must be used in all soil investigations.
Note: It is important to use the term "soil," not "dirt." Dirt and soil are not synonymous.

4 Weeks	**Physical Science (PS) Matter and Motion**	All matter is made up of small particles called atoms. Each atom takes up space, has mass and is in constant motion. Mass is the amount of matter in an object. Elements are a class of substances composed of a	"I Can"… Explain how atoms are the particles that make up all matter. Describe Dalton's and other scientists theory of atoms and how the theory developed and changed. Describe the modern theory of the atom. Define elements and explain	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes Homework Creating a three-dimensional model of the atom

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		single kind of atom. Molecules are the combination of two or more atoms that are joined together chemically. Compounds are composed of two or more different elements. Each element and compound has properties, which are independent of the amount of the sample.	how they are related to compounds. Describe the properties of a mixture. Explain how Mendeleev discovered the pattern that led to the periodic table. Tell what information is found in the periodic table.	Lab activity Atom marshmallows Lab activity Atom models for students Lab activity Elements, Compound, and Mixtures in the Bag Lab activity Classification of Matter

All matter is made of atoms, which are particles that are too small to be seen, even with a light microscope. There is empty space between the atoms that make up a substance. An element is a chemical substance that cannot be broken down into simpler substances.

There are approximately 90 different naturally occurring elements that have been identified. There are additional elements that were made in a laboratory, but these elements are not stable. All atoms of any one element are alike, but are different from atoms of other elements.

All substances are composed of one or more of elements. Compounds are composed of elements joined together chemically. Each compound has its own unique, unchanging composition of type and number of elements and atoms. Both elements and compounds can form molecules (e.g., elemental hydrogen is made up of molecules containing two atoms of hydrogen joined together chemically, water is a compound made up of molecules containing two atoms of hydrogen joined with one atom of oxygen). In addition to molecules, atoms may join together in large three-dimensional networks (addressed further in high school). All particles of a pure substance have nearly identical mass. Particles of different substances usually have different masses, depending upon their atomic composition. Computer simulations can be used to visualize this abstract material.

Matter has properties of mass and volume. Mass measures the amount of matter in an object (e.g., a wood block) or substance (e.g., water), and volume measures the three-dimensional space that matter occupies. Equal volumes of different substances usually have different masses. Some materials, like lead or gold, have a lot of mass in a relatively small space. Other materials, like Styrofoam® and air, have a small mass in a relatively large amount of space. This concept of comparing substances by the amount of mass the substance has in a given volume is known as density.

While the mass and volume of a material can change depending upon how much of the material there is, the density generally remains constant, no matter how much of the material is present. Therefore, density can be used to identify a material. The density of any object (e.g., a wood block) or substance (e.g., water) can be calculated from measurements by dividing the mass by the volume. Mass vs. volume graphs can be constructed and interpreted (e.g., to determine which material has the greater density.)

Note 1: Appropriate background knowledge such as graphics representing the atomic composition of the substances involved or descriptions of how the matter can be formed, decomposed or separated, should accompany questions asking to classify matter as an element, compound or mixture. The nature of chemical bonding is not appropriate at this grade.

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Note 2: Constructing and analyzing mass vs. volume graphs aligns with fifth-grade common core mathematics standards (Geometry 1 and 2). The volume of solids can be determined by water displacement or calculated from the dimensions of a regular solid (grade 5 Common Core Mathematics Standards, Measurement and Data 5).
Note 3: The structure of the atom, including protons, neutrons and electrons, is addressed in the high school physical science syllabus.

3-4 Weeks	**Physical Science (PS) Matter and Motion**	Changes of state are explained by a model of matter composed of atoms and/or molecules that are in motion. When substances undergo changes of state, neither atoms nor molecules themselves are changed in structure. Thermal energy is a measure of the motion of the atoms and molecules in a substance. Mass is conserved when substances undergo changes of state. **Note:** Thermal energy can be connected to kinetic energy at this grade level.	"I Can"… Describe the characteristics of a solid, liquid, and a gas. Identify the properties used to describe matter. Differentiate between weight and mass. Identify the units used to express the amount of space occupied by matter. Describe how the density of a material is determined. Describe what a physical and chemical change is. Distinguish between physical and chemical changes in matter. Explain how changes in matter are related to changes in energy. Describe how chemical energy is related to chemical change. Identify forms of energy that are related to changes in matter.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes Homework Lab activities 3 and 4…Properties of solids and liquids Lab activity Finding: mass, volume, and density Lab activity Density: solids in liquids

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Thermal energy is the total amount of kinetic energy present in a substance (the random motion of its atoms and molecules). When thermal energy increases, the total kinetic energy of the particles in the system increases. The thermal energy of a substance depends upon the mass of the substance, the nature of the material making up the substance, and the average kinetic energy of the particles of the substance. Thermal energy cannot be directly measured; however, changes in thermal energy can be inferred based on changes in temperature. The higher the temperature of a particular substance, the greater the average kinetic energy and motion of the particles. Thermal energy depends on the amount of the substance, whereas temperature does not depend on the amount of the substance.

Solids, liquids and gases vary in the motion of and the spacing and attractions between particles. Solid particles are close together and held more rigidly in a space by the attractions between the particles. However, solid particles can still vibrate back and forth within this space. Liquid particles may be slightly farther apart but move with more speed than solid particles. In liquids, particles can move from one side of the sample to another. Gas particles are much farther apart and move with greater speed than liquid or solid particles. Because of the large spaces between the particles, gases are easily compressed into smaller volumes by pushing the particles closer together. Most substances can exist as a solid, liquid or gas depending on temperature. Generally, for a specific temperature, materials that exist as solids have the greatest attraction between the particles. Substances that exist as gases generally have the weakest attraction between the particles.

During phase changes, the mass of the substance remains constant because the particles (atoms and molecules) are not created or destroyed. There is simply a change in the motion of and spacing between the particles. Experiments and investigations (3-D and virtual) must be used to demonstrate phase changes.

For substances to rearrange and form new substances, often the particles of the substances must first collide. The higher the temperature, the greater the average motion and the more likely the particles are to collide and rearrange to form new substances. In a solid, particles are rigidly held in fixed position. When the solid dissolves in water, the particles of the solid separate and move freely with the water particles. Therefore, particles in the dissolved state are more likely to collide with other particles and rearrange to form a new substance than they are as a solid.

Since moving atoms and molecules cannot be observed directly, provide the opportunity to experiment with temperature, phase changes and particle motion using virtual labs.

Note 1: Purdue University provides a table that can help in differentiating the properties of solids, gases and liquids.

2 Weeks	**Physical Science (PS) Matter and Motion**	An object's motion can be described by its speed and the direction in which it is moving. An object's position and speed can be measured and graphed as a function of time. **Note 1:** This begins to quantify student observations using	"I Can"… Determine when an object is in motion. Describe how scientists measure distance. Calculate an object's speed and velocity. Demonstrate how to graph motion.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes Homework Lab activity Metric Measurements

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		appropriate mathematical skills. **Note 2:** Velocity and acceleration rates should not be included at this grade level; these terms are introduced in high school.	Describe the motion of an object as it accelerates. Calculate acceleration. Describe what graphs are used to analyze the motion of an accelerating object.	Lab activity Crash Dummies

When speed is calculated from a distance measurement, the distance is always measured from some reference point. To describe more thoroughly the motion of an object, the direction of motion can be indicated along with the speed.

Experiments (inside and outside of the classroom) and creating/interpreting graphs must be used to investigate motion. Plotting position (vertically) and time (horizontally) can be used to compare and analyze motion. No motion is represented by a horizontal line. Fast motion is represented by steep lines and slow motion is represented by lines that are more gradual. The relative speeds and positions of different objects can be determined from comparing their position vs. time graphs. Position vs. time graphs should not be rules to memorize, but interpretations based on data-driven graphs. Motion detectors can be used to compare the resulting graphs from different types of motion.

Plotting the speed (vertical axis) and time (horizontal axis) allows for comparison and analysis of speed. One can determine the speed of an object at any given time or determine the time at which an object has a particular speed from reading a speed vs. time graph. No motion would be shown with a straight horizontal line on the horizontal axis. Constant speed would be represented with a straight line above or below the horizontal axis. The faster the motion, the farther away the line will be from the horizontal axis. Speeding up would be represented with a line moving away from the horizontal axis. Slowing down would be represented with a line moving toward the horizontal axis. Speed vs. time graphs should not be rules to memorize, but interpretations based on data-driven graphs.

If a force on an object acts toward a single center, the object's path may curve into an orbit around the center. A sponge attached to the end of a string will travel in a circular path when whirled. The string continually pulls the sponge toward the center, resulting in circular motion.

Note 1: This content is a precursor to the introduction of vectors. Using the word "vector" and exploring other aspects of vectors are not appropriate at this grade.

Note 2: Constructing and analyzing motion graphs aligns with fifth-grade common core mathematics standards (Geometry 1 and 2). At this grade, interpretations of position vs. time graphs should be limited to comparing lines with different slopes to indicate whether objects are moving relatively fast, relatively slow or not moving at all. More complex interpretations of position vs. time graphs will be made at higher grade levels. At this grade, interpretations of speed vs. time graphs should be limited to differentiating between standing still, moving at a constant relatively fast speed, moving at a constant relatively slow speed, speeding up and slowing down. More complex interpretations of speed vs. time graphs will be made at higher grade levels.

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Time	**Strands**	**Standards**	**Student Learning Targets "I Can" Statements**	**Assessments**
2 Weeks	**Physical Science (PS) Matter and Motion**	There are two categories of energy: kinetic and potential. Objects and substances in motion have kinetic energy. Objects and substances can have energy as a result of their position (potential energy). **Note:** Kinetic and potential energy should be introduced at the macroscopic level for this grade. Chemical and elastic potential energy should not be included at this grade; this is found in PS grade 8.	"I Can"… Describe how energy, work, and power are related. Name and describe the two basic kinds of energy.	Be able to: Answer critical questions Observational data based on class participation Test/Quizzes Homework Lab activity Design and Build a Roller Coaster Lab activity Design and Build a Roller Coaster Computer Lab

There are many forms of energy, but all can be put into two categories: kinetic and potential. Kinetic energy is associated with the motion of an object. The kinetic energy of an object changes when its speed changes. Potential energy is the energy of position between two interacting objects. Gravitational potential energy is associated with the height of an object above a reference position. The gravitational potential energy of an object changes as its height above the reference changes. Electrical energy is associated with the movement of electricity through the wires of an electrical device. Thermal energy refers to the total amount of kinetic energy a substance has because of the random motion of its atoms and molecules. Sound energy is associated with the back and forth movement of the particles of the medium through which it travels. Provide opportunities to explore many types of energy. Virtual experiments that automatically quantify energy can be helpful since using measurements to calculate energy is above grade level.
Note: Using the word "stored" to define potential energy is misleading. The word "stored" implies that the energy is kept by the object and not given away to another object. Therefore, kinetic energy also can be classified as "stored" energy. A rocket moving at constant speed through empty space has kinetic energy and is not transferring any of this energy to another object.