	Content Statement	I Can…	Key Vocabulary
Rocks, Minerals and Soil (ESS)	1. Minerals have specific, quantifiable properties. **NOTE**: Emphasis should be on learning how to identify the mineral by conducting tests (not through memorization).	-Identify the different processes and/or environments in which minerals can form (e.g., evaporation, chemical processes, sedimentary, igneous or metamorphic). -Classify and/or identify minerals based on their measurable properties. -Compare and contrast rocks and minerals. -Test the properties of minerals in order to identify them (luster, hardness, cleavage, streak, magnetism, fluorescence and/or crystal shape). -Use appropriate tools and safety procedures to test mineral properties. -Use technology to help research minerals. -Use minerals to help identify the rocks they are found in (e.g., calcite, halite, dolomite, gypsum, quartzes, feldspars, micas, talc, kaolinite, chalk, topaz, corundum).	• Minerals • Sedimentary rock • Igneous rock • Metamorphic rock • Luster • Hardness • Cleavage • Streak • Magnetism • Fluorescence • Crystal shape • Classification and Classify • Safety procedures/ and protocol • Mineral properties

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Rocks, Minerals and Soil (ESS)	2. Igneous, metamorphic and sedimentary rocks have unique characteristics that can be used for identification and/or classification. **NOTE**: The purpose of rock identification must be related to understanding the environment in which the rock formed.	-Experiment with different types of rocks for the purposes of identification and classification (igneous rock must include: granite, rhyolite, basalt, obsidian, pumice and andesite; metamorphic rock must include: schist, gneiss, slate, marble, anthracite and phyllite; sedimentary rock must include: limestone, sandstone, shale, conglomerate and breccias; others must include bituminous coal, coquina, and chert). -Use proper safety protocol and procedures when testing rocks. -Use the identification of the minerals, the mineral arrangement, and other measurable characteristics within the rock to identify the rock. -Use rock characteristics to interpret its history of formation, breakdown (weathering) and transport (erosion). -Research current identification methods and techniques of investigating rocks.	• Igneous rock • Sedimentary rock • Metamorphic rock • Classification • Minerals • Weathering • Erosion • Identification • Safety procedures and protocol

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	Content Statement	I Can…	Key Vocabulary
Rocks, Minerals and Soil (ESS)	3. Igneous, metamorphic and sedimentary rocks form in different ways.	-Identify the main components of the rock cycle. -Use the rock cycle to describe the formation of igneous, sedimentary and metamorphic rocks. -Understand that rocks and minerals in rocks form in specific types of environments. -Read geologic, physical and topographical maps to see how the types of geologic structures and features help identify the types of rock that may be found in specific areas and to understand the environmental conditions that needed to exist during the formation. -Research rocks and minerals in Ohio to understand their history of formation (e.g., formation of Ohio sandstone and limestone indicates that a shallow sea once covered Ohio, Ohio's geologic history and past environmental conditions help understand the existing bedrock in Ohio). -Make connections between the typical pattern of coal formation and energy in Ohio.	• Rock cycle • Igneous rock • Sedimentary rock • Metamorphic rock • Minerals • Geologic map • Topographical map • Physical map • Sandstone • Limestone • Bedrock • Coal • Geologic structures

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Rocks, Minerals and Soil (ESS)	4. Soil is unconsolidated material that contains nutrient matter and weathered rock. **NOTE**: Soil sampling and testing must be used to investigate soil. **NOTE**: It is important to use the term "soil," not "dirt." Dirt and soil are not synonymous.	-Investigate soil in order to determine its texture, color, composition, permeability and porosity. -Use the properties of soil to observe, identify and measure soil horizons. -Determine proper uses for soil based on its properties (e.g., some soils may be recommended for agriculture, while others may be used for brick making or creating a pond). -Understand that soil forms at different rates and different measurable properties, depending on the environmental conditions. -Make connections between environmental conditions, types of bedrock and soil properties. -Investigate different soil sampling testing methods and equipment. -Use soil maps (paper or digital) combined with geologic, aerial or topographic maps to help identify local soil formations. -Make connections between soil depletion and natural events (e.g., desertification, mass wasting, erosion, landslide, dust bowl, etc.). -Recognize that soil forms in layers known as horizons that can be distinguished from one another by properties that can be measured.	• Soil • Soil horizon • Texture • Composition • Permeability • Bedrock • Geologic map • Aerial map • Topographic map • Soil sampling/testing • Porosity • Soil map • Soil depletion • Desertification • Mass wasting • Erosion • Landslide • Dust bowl • Unconsolidated

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	Content Statement	I Can…	Key Vocabulary
Rocks, Minerals and Soil (ESS)	5. Rocks, minerals and soils have common and practical uses. **NOTE**: Nonrenewable energy sources should be included (such as fossil fuels).	-Recognize that the characteristics of soil, rocks and minerals determine how they can be used. -Research different uses of minerals, soil and rock within the community and within Ohio. -Identify examples of different ways that soil, rocks and minerals can be used including: -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). -Describe different methods of extracting rocks, minerals and soils. -Describe ways to conserve resources through the management of resources (e.g., extraction methods, use, storage and disposal). -Understand that almost all manufactured materials require some kind of geologic resource. -Recognize that rocks, minerals and soil are examples of geologic resources that are nonrenewable.	• Minerals • Soil • Extract • Nonrenewable energy sources • Conserve • Geologic resource

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Cellular to Multicellular (LS)	6. Cells are the fundamental unit of life. **NOTE**: 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. **NOTE**: 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 the cell 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). **NOTE**: 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).	-Describe how the structure of specialized cells that form tissues (e.g., xylem, phloem, connective, muscle, nervous) relates to the function that the cells perform. -Build a model of a plant or animal cell and explain how the cellular structures and their functions contribute to the survival of the cell. -Use a microscope, micrograph, model or illustration to observe a single-celled organism label the visible cellular structures, and explain how a single-celled organism carries out all functions required for life. -Understand that the cells of multicellular organisms can be organized at various levels to carry out all the basic functions of life. -Recognize that different body tissues and organs can be made up of different kinds of cells. -Understand that cells in similar tissues and organs in animals are similar while the tissues and organs found in plants differ slightly from similar tissues in animals. -Use the Modern Cell Theory to explain how scientific theories are developed over time. -Use microscopes, micrographs, safety procedures, models and illustrations to observe cells from many different types of organisms: -Eubacteria (cyanobacteria) -Protista (algae, amoeba, diatoms, euglena, volvox) -Fungi (common mushrooms, bread molds) -Plantae (mosses, ferns, angiosperms) -Use a microscope to view cells, tissues (xylem, phloem, connective, muscle, nervous) and organs (leaf, stem, flower, spore, ganglia, blood vessels, eyes) to compare and contrast their similarities and differences.	• Cell • Micrograph • Eubacteria • Protista • Fungi • Tissues • Organ • Modern Cell Theory • Animal cell • Plant cell • Scientific theories • Phloem • Cellular structures • Plantae • Single-celled organism • Model • Multicellular organism • Safety procedures • Xylem

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Cellular to Multicellular (LS)	7. All cells come from pre-existing cells. **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. **NOTE**: 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. **NOTE**: It is not appropriate to learn the names of the stages of mitosis nor the chemicals and chemical processes associated with the genetic material. 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.	-Recall that the Modern Cell Theory states that all cells come from pre-existing cells. -Understand that reproduction is necessary to continue a species because individual organisms do not live forever. -Realize that traits are passed onto the next generation through reproduction. -Recognize that single-celled organisms reproduce by dividing into 2 new cells (binary fission). -Recognize that in multicellular organisms, cells multiply for growth and repair. -Describe chromosomes as a structure in cells that contains the genetic material. -Generally explain the process/purpose of mitosis. -Observe cells from different organisms in the process of dividing by using microscopes, micrographs, models and illustrations. -Understand why spontaneous generation is not true. -Discuss how Redi and Pasteur show how evidence can lead to new knowledge, better explanations and spur new technology. -Model the movement of chromosomes during plant cell division focusing on how the process ensures genetic information is passed from one generation to the next.	• Modern Cell Theory • Reproduction • Mitosis • Chromosome • Genetic material and information • Micrograph • Spontaneous generation • Cells • Meiosis • Parent cell • Daughter cell • Generation • Single-celled organisms • Binary fission • Multicellular organism • Redi • Pastuer • Model • Traits

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Cellular to Multicellular (LS)	8. Cells carry on specific functions that sustain life. NOTE: 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. NOTE: Emphasis should be placed on the function and coordination of cell components, as well as on their roles in overall cell function.	-Describe the different structures in a cell as it is related to their functions. -Recognize that the functions of cell structures are regulated and controlled (e.g., a cell membrane controls what can enter and leave the cell. -Explain the role of cells, tissues, organs and organ systems that carry out life functions for organisms. -Identify and explain the roles of systems including: homeostasis, gas exchange, energy transfers and transformation, transportation of molecules, disposal of wastes and synthesis of new molecules. -Make connections between organelles and processes. -Explore conditions that optimize and/or minimize cellular function in a cell or organism. -Predict and test what will happen when a cell is placed in a variety of solutions (e.g., an Elodea cell placed in tap water, distilled water and salt water. -Compare sample cells from different tissues (e.g., muscle, skin, root, stem, leaf) in plants and animals.	• Cells • Functions • Modern Cell Theory • Tissues • Organs • Organ systems • Homeostasis • Gas exchange • Energy transfer • Energy transformation • Synthesis • Organelles

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Cellular to Multicellular (LS)	9. Living systems at all levels of organization demonstrate the complementary nature of structure and function.	-Recognize that all parts of an organism perform specialized functions as a whole to ensure the survival of the organism. -Recognize that groups of specialized cells form a tissue. -Compare the four major types of tissues (epithelial, connective, nerve and muscle). -Make distinctions among organisms (e.g., body plans, symmetry, internal structures) in order to classify them into a scientifically based group (types of plants, animals, etc.). -Group organisms based on their similar external structures, internal structures and processes. -Explore how all things are similar by observing tissues, organs, cell structures, systems, and symmetry for plants and animals. -Use inquiry and mathematical relationships to link cell size and the cell's ability to transport necessary materials into its interior. -Compare an organism's ability to survive in its environment with its body plans, symmetry and internal structures.	• Tissue • Cell • Epithelial tissue • Connective tissue • Nerve tissue • Muscle tissue • Symmetry • Structure • Function • Body plans • Internal structure • External structures • Organs • Cell structures • Systems

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Matter and Motion (PS)	10. All matter is made up of small particles called atoms. **NOTE**: 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. **NOTE**: 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**: The structure of the atom, including protons, neutrons and electrons, is addressed in the high school physical science syllabus.	-Recognize that all matter is made of atoms. -Describe atoms as particles that are too small to be seen, even with a light microscope. -Realize that there is empty space between the atoms that make up a substance. -Describe an element as a chemical substance that cannot be broken down into simpler substances. -Realize that all atoms of any one element are alike, but are different from atoms of other elements. -Understand that there are naturally occurring elements and elements that were made in a laboratory (but these elements are not stable). -Describe the behavior of atomic particles for each state of matter (solid, liquid, gas). -Draw a model/pictorial representation that depicts the behavior of atomic particles for each state of matter (solid, liquid, gas). -Calculate the volume of a rectangular solid from its dimensions. -Calculate the volume of an irregularly shaped solid using the water displacement method. -Recognize that all substances are composed of one or more elements. -Recall that compounds are elements joined together chemically and each compound has its own unique, unchanging composition of type and number of elements and atoms.	• Atom • Element • Molecule • Compound • Volume • Water displacement • Mass • Density • Pure substance • Atomic composition • Atomic particles • Mass vs. volume graph

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Matter and Motion (PS)	10. All matter is made up of small particles called atoms. (*Continued*)	-Realize that both elements and compounds can form molecules. -Understand that all particles of a pure substance have nearly identical mass while particles of different substances usually have different masses, depending on their atomic composition. -Differentiate between mass and volume. -Experiment to prove that equal volumes of different substances usually have different masses. -Distinguish between materials that have a lot of mass in a relatively small space (e.g., lead, gold) and those that have a small mass in a relatively large amount of space (e.g., Styrofoam©, air). -Compare substances by the amount of mass the substance has in a given volume to determine density. -Experiment to show that density generally remains constant no matter how much of a material is present while mass and volume of a material can change depending upon how much there is of the material. -Identify different materials using density. -Calculate density by dividing the mass by the volume. -Use mass vs. volume graphs to determine which material has the greater density. -Recognize that atoms can join together in large three-dimensional networks.	

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Matter and Motion (PS)	11. Changes of state are explained by a model of matter composed of atoms and/or molecules that are in motion. **NOTE**: Thermal energy can be connected to kinetic energy at this grade level.	-Explain in terms of the atomic theory why gases can be easily compressed, while liquids and solids cannot. -Explain how the arrangement of atoms determines the specific properties (e.g., compressibility, ability to take the shape of a container, speed of particle movement, attraction between particles, space between particles, etc.) of solids, liquids and gases. -Explain the many different traits of thermal energy: -Total amount of kinetic energy present in a substance (the random motion of its atoms and molecules), -When it increases, total kinetic energy of the particles in the system increases, and -Depends upon the mass of the substance (temperature does not!), the nature of the material making up the substance, and the average kinetic energy of the particles of the substance. -Identify the state of matter of a substance based on the arrangement and movement of its particles. -Realize that when substances undergo changes of state, neither atoms nor molecules themselves are changed in structure. -Demonstrate that the mass of a substance does not change during a phase change because the particles are not created or destroyed (there is simply a change in the motion of and spacing between particles). -Explain what happens to the particles of a substance when it rearranges to form new substances. -Use virtual labs to experiment with temperature, phase changes and particle motion -Understand that the higher the temperature of the substance, the greater the average kinetic energy and motion of the particles.	• Change of state • Molecule • Atom • Thermal energy • Kinetic energy • Compressibility • Mass • Temperature • Atomic theory • Atomic particles • State of matter • Phase change

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Matter and Motion (PS)	12. There are two categories of energy: kinetic and potential. **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. **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.	-Identify all types of energy as either kinetic or potential. -Explore, identify and describe: -Gravitational potential energy -Electrical energy -Thermal energy -Sound energy -Investigate the relationship between height and gravitational potential energy: height increases gravitational potential energy. -Recall that an object can have potential energy due to its position relative to another object and can have kinetic energy due to its motion. -Investigate energy transfers in a simple design (e.g., waterwheel): -Classify the energy at each state in the design as kinetic, potential or a combination of the two, -Identify effective and ineffective design features, and -Redesign to incorporate best design practices.	• Kinetic energy • Potential energy • Gravitational potential energy • Electrical energy • Thermal energy • Sound energy • Constant speed • Design/design practices

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.

	Content Statement	I Can…	Key Vocabulary
Matter and Motion (PS)	13. An object's motion can be described by its speed and the direction in which it is moving. **NOTE**: This begins to quantify student observations using appropriate mathematical skills. **NOTE**: Velocity and acceleration rates should not be included at this grade level; these terms are introduced in high school. **NOTE**: Part of 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**: 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. 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.	-Describe the motion of an object by indicating direction and speed. -Create/use a position vs. time graph to investigate motion. -Use a position vs. time graph to compare and analyze motion of an object. -Use speed vs. time graph to determine the time at which an object has a particular speed. -Calculate the average speed of an object given the distance and time. -Identify what is changing and what is not changing for an object moving at constant speed. -Recognize that if a force on an object acts toward a single center, the object's path may curve into an orbit around the center (e.g., 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).	• Speed • Position vs. time graph • Speed vs. time graph • Motion graphs • Average speed • Constant speed • Orbit

For further explanation and details visit the "Science Revised Academic Content Standards (2010) and Model Curriculum Development" on the ODE website.