SCIENCE OVERVIEW
GRADE: EIGHTH
Lemont-Bromberek CSD 113A

What is the story an eighth grader is able to tell by the end of the year?
Scientists ask many of their most compelling and productive questions in science about why or how something happens. They investigate cause and effect relationships and often use those relationships to predict phenomena in both natural and designed systems. Scientists use models to represent systems and their interactions. They use models on diverse scales to study time, space and energy phenomena within systems.

UNITS of STUDY	SCIENTIFIC & ENGINEERING PRACTICES *The actual doing of science and engineering piques student interest*	DISCIPLINARY CORE IDEAS *Key ideas that build conceptually throughout the K-8 experience*	CROSSCUTTING CONCEPTS *Important themes that pervade science, engineering and mathematics*
LIFE SCIENCE *Growth, Development and Reproduction of Organisms* *Natural Selection and Adaptation*	**Developing and Using Models** Develop and use a model to describe phenomena **Analyzing and Interpreting Data** Analyze displays of data to identify linear and nonlinear relationships. Analyze and interpret data to determine similarities and differences in findings. **Using Mathematics and Computational Thinking** Use mathematical representations to support scientific conclusions and design solutions. **Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue today. Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. Construct an explanation that includes qualitative or quantitative relationships	**Growth and Development of Organisms** Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. Genetic factors as well as local conditions affect the growth of the adult plant. **Inheritance of Traits** Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.	**Patterns** Patterns can be used to identify cause and effect relationships. Graphs, charts, and images can be used to identify patterns in data. **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems. Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. **Structure and Function** Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural and designed structures/systems can be analyzed to determine how they function. **Interdependence of Science, Engineering, and Technology** Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

Life Science Continued	between variables that describe phenomena. **Engaging in Argument from Evidence** Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. **Obtaining, Evaluating, and Communicating Information** Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.	**Variation of Traits** In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. **Evidence of Common Ancestry and Diversity** The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. **Natural Selection** In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by	

Life Science Continued		genes, which are then passed on to offspring. Natural selection leads to the predominance of certain traits in a population, and the suppression of others. **Adaptation** Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.	
PHYSICAL SCIENCE *Forces & Interactions*	**Asking Questions and Defining Problems** Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. **Planning and Carrying Out Investigations** Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. **Constructing Explanations and Designing Solutions**	**Forces and Motion** For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. All positions of objects and the directions of forces and motions must be described in an	**Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Systems and System Models** ● Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. **Stability and Change** ● Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. **Connections to Engineering, Technology, and Applications of Science** **Influence of Science, Engineering, and Technology on Society and the Natural World** ● The uses of technologies and any

Physical Science continued	Apply scientific ideas or principles to design an object, tool, process or system. **Engaging in Argument from Evidence** Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. **Types of Interactions** Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. Forces that act at a distance can be explained by fields that extend through space and can be mapped by their effect on a test object **A Definitions of Energy** Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. A system of objects may also contain stored (potential) energy, depending on their relative positions. **Relationship Between Energy and Forces** • When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.	limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.
EARTH SCIENCE *History of Earth* *Earth Systems*	**Analyzing and Interpreting Data** Analyze and interpret data to provide evidence for phenomena.	**The History of Planet Earth** The geologic time scale interpreted from rock strata provides a way to organize	**Patterns** Patterns in rates of change and other numerical relationships can provide

Earth Science Continued	**Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. **Developing and Using Models** Develop and use a model to describe phenomena. Develop a model to describe unobservable mechanisms. **Constructing Explanations and Designing Solutions** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. **Earth's Materials and Systems** The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **Plate Tectonics and Large-Scale System Interactions** Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. **Earth's Materials & Systems** All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. **Natural Resources** ● Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources.	information about natural and human designed systems. **Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Energy and Matter** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. **Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, inc.

		Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.	