SCIENCE OVERVIEW
GRADE: SEVENTH
Lemont-Bromberek CSD 113A

What is the story a seventh grader is able to tell by the end of the year?
Scientists investigate and model the transfers and cycles of matter and energy. They apply their understanding of the transfers and cycles of matter and energy to many areas of science and engineering. By investigating the inputs, outputs, and flows of matter and energy both scientists and engineers inform their understanding of systems and phenomena from space exploration to ecosystems.

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 *Matter and Energy in Organisms And Ecosystems* *Interdependent Relationships in Ecosystems*	**Developing and Using Models** Develop a model to describe phenomena. Develop a model to describe unobservable mechanisms. **Analyzing and Interpreting Data** Analyze and interpret data to provide evidence for phenomena. **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. Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	**Organization for Matter and Energy Flow in Organisms** Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. **Interdependent Relationships in Ecosystems** Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Energy and Matter** Matter is conserved because atoms are conserved in physical and chemical processes. Within a natural system, the transfer of energy drives the motion and/or cycling of matter. The transfer of energy can be tracked as energy flows through a natural system. **Stability and Change** Small changes in one part of a system might cause large changes in another part. **Patterns** Patterns can be used to identify cause and effect relationships.

Life Science Continued	**Engaging in Argument from Evidence** Construct 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. Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources. Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. **Cycle of Matter and Energy Transfer in Ecosystems** Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	

Life Science Continued		**Ecosystem Dynamics, Functioning, and Resilience** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. **Energy in Chemical Processes and Everyday Life** The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.	

PHYSICAL SCIENCE *Waves and Electromagnetic Radiation*	**Developing and Using Models** Develop and use a model to describe phenomena. **Using Mathematics and Computational Thinking** Use mathematical representations to describe and/or support scientific conclusions and design solutions. **Obtaining, Evaluating, and Communicating Information** Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.	**Waves & Properties** A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. A sound wave needs a medium through which it is transmitted. **Electromagnetic Radiation** When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. However, because light can travel through space, it cannot be a matter wave, like sound or water waves. **Information Technologies and Instrumentation** Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.	**Patterns** Graphs and charts can be used to identify patterns in data. **Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. Structures can be designed to serve particular functions.

EARTH/SPACE SCIENCE *Space Systems*	**Developing and Using Models** Develop and use a model to describe phenomena. **Analyzing and Interpreting Data** Analyze and interpret data to determine similarities and differences in findings.	**The Universe & Stars** Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. **Earth and the Solar System** The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity	**Patterns** Patterns can be used to identify cause and effect relationships. **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. **Systems and System Models** Models can be used to represent systems and their interactions. **Connections to Engineering, Technology, and Applications of Science** **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.