GRADE 7 OVERVIEW

In grades six through eight, the standards and performance indicators for the science and engineering practices and core science content, transition students to developing and planning controlled investigations to create more explicit and detailed models and explanations. The seven core concepts (patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change) are reinforced in the appropriate context of the core science content through hands-on instruction in the classroom. Science in the middle school provides students with the foundation to be successful in high school science courses, by providing a range of content in the life, earth, and physical sciences.

These academic standards and performance indicators establish the practices and core content that South Carolina's students should know and be able to do by the end of grade seven.

The four core areas of the grade seven standards include:

- Classification and Conservation of Matter
- Organization in Living Systems
- Heredity – Inheritance and Variation of Traits
- Interactions of Living Systems and the Environment

The eight science and engineering practices describe how students should learn and demonstrate knowledge of the content outlined in the content standards. Engaging in these practices will help students become scientifically literate and astute consumers of scientific information.

Students should engage in scientific and engineering practices as a means to learn about the specific topics identified for their grade level. It is critical that educators understand the Science and Engineering Practices are ***not*** to be taught in isolation. There should ***not*** be a distinct "Inquiry" unit at the beginning of each school year. Rather, the practices need to be employed ***within the content*** for each grade level.

Teachers, schools, and districts should use these standards and indicators to provide a wide variety of experiences, materials, and instructional strategies that accommodate a broad range of individual differences. These standards support active engagement in learning. Classrooms will need to be supplied with the materials and equipment necessary to complete scientific investigations

The academic standards and performance indicators for grade seven should be the basis for the development of classroom and grade-level assessments. In addition, these standards and performance indicators will be the basis for the development of items on the state-required South Carolina Palmetto Assessment of State Standards (SC-PASS). Students must demonstrate knowledge of the science and engineering practices and core content ideas in preparation for future science courses.

GRADE SEVEN
SCIENCE AND ENGINEERING PRACTICES

NOTE: Scientific investigations should always be done in the context of content knowledge expected at this grade level. The standard describes how students should learn and demonstrate knowledge of the content outlined in the other standards.

Standard 7.S.1: The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.

7.S.1A. Conceptual Understanding: The practices of science and engineering support the development of science concepts, develop the habits of mind that are necessary for scientific thinking, and allow students to engage in science in ways that are similar to those used by scientists and engineers.

Performance Indicators: Students who demonstrate this understanding can:

7.S.1A.1 Ask questions to (1) generate hypotheses for scientific investigations, (2) refine models, explanations, or designs, or (3) extend the results of investigations or challenge claims.

7.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

7.S.1A.3 Plan and conduct controlled scientific investigation to answer questions, test hypotheses, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.

7.S.1A.4. Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

7.S.1A.5 Use mathematical and computational thinking to (1) use and manipulate appropriate metric units, (2) collect and analyze data, (3) express relationships between variables for models and investigations, or (4) use grade-level appropriate statistics to analyze data.

7.S.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

7.S.1A.7 Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.

7.S.1A.8 Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations.

7.S.1B. Conceptual Understanding: Technology is any modification to the natural world created to fulfill the wants and needs of humans. The engineering design process involves a series of iterative steps used to solve a problem and often leads to the development of a new or improved technology.

Performance Indicators: Students who demonstrate this understanding can:

7.S.1B.1 Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.

GRADE SEVEN
PHYSICAL SCIENCE: CLASSIFICATION AND CONSERVATION OF MATTER

Standard 7.P.2: The student will demonstrate an understanding of the structure and properties of matter and that matter is conserved as it undergoes changes.

7.P.2A. Conceptual Understanding: All substances are composed of one or more elements. Elements are pure substances which contain only one kind of atom. The periodic table organizes these elements based on similar properties. Compounds are substances composed of two or more elements. Chemical formulas can be used to describe compounds.

Performance Indicators: Students who demonstrate this understanding can:

7.P.2A.1 Develop and use simple atomic models to illustrate the components of elements (including the relative position and charge of protons, neutrons, and electrons).

7.P.2A.2 Obtain and use information about elements (including chemical symbol, atomic number, atomic mass, and group or family) to describe the organization of the periodic table.

7.P.2A.3 Analyze and interpret data to describe and classify matter as pure substances (elements or compounds) or mixtures (heterogeneous or homogeneous) based on composition.

7.P.2A.4 Construct explanations for how compounds are classified as ionic (metal bonded to nonmetal) or covalent (nonmetals bonded together) using chemical formulas.

7.P.2B. Conceptual Understanding: Substances (such as metals or acids) are identified according to their physical or chemical properties. Changes to substances can either be physical or chemical. Many substances react chemically with other substances to form new substances with different properties. According to the law of conservation of matter, total mass does not change in a chemical reaction.

7.P.2B.1 Analyze and interpret data to describe substances using physical properties (including state, boiling/melting point, density, conductivity, color, hardness, and magnetic properties) and chemical properties (the ability to burn or rust).

7.P.2B.2 Use mathematical and computational thinking to describe the relationship between the mass, volume, and density of a given substance.

7.P.2B.3 Analyze and interpret data to compare the physical properties, chemical properties (neutralization to form a salt, reaction with metals), and pH of various solutions and classify solutions as acids or bases.

7.P.2B.4 Plan and conduct controlled scientific investigations to answer questions about how physical and chemical changes affect the properties of different substances.

7.P.2B.5 Develop and use models to explain how chemical reactions are supported by the law of conservation of matter.

GRADE SEVEN
LIFE SCIENCE: ORGANIZATION IN LIVING SYSTEMS

Standard 7.L.3: The student will demonstrate an understanding of how the levels of organization within organisms support the essential functions of life.

7.L.3A. Conceptual Understanding: Cells are the most basic unit of any living organism. All organisms are composed of one (unicellular) or many cells (multicellular) and require food and water, a way to dispose of waste, and an environment in which they can live in order to survive. Through the use of technology, scientists have discovered special structures within individual cells that have specific functions that allow the cell to grow, survive, and reproduce. Bacteria are one-celled organisms found almost everywhere and can be both helpful and harmful. They can be simply classified by their size, shape and whether or not they can move.

Performance Indicators: Students who demonstrate this understanding can:

7.L.3A.1 Obtain and communicate information to support claims that (1) organisms are made of one or more cells, (2) cells are the basic unit of structure and function of organisms, and (3) cells come only from existing cells.

7.L.3A.2 Analyze and interpret data from observations to describe different types of cells and classify cells as plant, animal, protist, or bacteria.

7.L.3A.3 Develop and use models to explain how the relevant structures within cells (including cytoplasm, cell membrane, cell wall, nucleus, mitochondria, chloroplasts, lysosomes, and vacuoles) function to support the life of plant, animal, and bacterial cells.

7.L.3A.4 Construct scientific arguments to support claims that bacteria are both helpful and harmful to other organisms and the environment.

7.L.3B. Conceptual Understanding: Multicellular organisms (including humans) are complex systems with specialized cells that perform specific functions. Organs and organ systems are composed of cells that function to serve the needs of cells which in turn serve the needs of the organism.

Performance Indicators: Students who demonstrate this understanding can:

7.L.3B.1 Develop and use models to explain how the structural organizations within multicellular organisms function to serve the needs of the organism.

7.L.3B.2 Construct explanations for how systems in the human body (including circulatory, respiratory, digestive, excretory, nervous, and musculoskeletal systems) work together to support the essential life functions of the body.

GRADE SEVEN
LIFE SCIENCE: HEREDITY – INHERITANCE AND VARIATION OF TRAITS

Standard 7.L.4: The student will demonstrate an understanding of how genetic information is transferred from parent to offspring and how environmental factors and the use of technologies influence the transfer of genetic information.

7.L.4A. Conceptual Understanding: Inheritance is the key process causing similarities between parental organisms and their offspring. Organisms that reproduce sexually transfer genetic information (DNA) to their offspring. This transfer of genetic information through inheritance leads to greater similarity among individuals within a population than between populations. Technology allows humans to influence the transfer of genetic information.

Performance Indicators: Students who demonstrate this understanding can:

7.L.4A.1 Obtain and communicate information about the relationship between genes and chromosomes to construct explanations of their relationship to inherited characteristics.

7.L.4A.2 Construct explanations for how genetic information is transferred from parent to offspring in organisms that reproduce sexually.

7.L.4A.3 Develop and use models (Punnett squares) to describe and predict patterns of the inheritance of single genetic traits from parent to offspring (including dominant and recessive traits, incomplete dominance, and codominance).

7.L.4A.4 Use mathematical and computational thinking to predict the probability of phenotypes and genotypes based on patterns of inheritance.

7.L.4A.5 Construct scientific arguments using evidence to support claims for how changes in genes (mutations) may have beneficial, harmful, or neutral effects on organisms.

7.L.4A.6 Construct scientific arguments using evidence to support claims concerning the advantages and disadvantages of the use of technology (such as selective breeding, genetic engineering, or biomedical research) in influencing the transfer of genetic information.

GRADE SEVEN
ECOLOGY: INTERACTIONS OF LIVING SYSTEMS AND THE ENVIRONMENT

Standard 7.EC.5: The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.

7.EC.5A. Conceptual Understanding: In all ecosystems, organisms and populations of organisms depend on their environmental interactions with other living things (biotic factors) and with physical (abiotic) factors (such as light, temperature, water, or soil quality). Disruptions to any component of an ecosystem can lead to shifts in its diversity and abundance of populations.

Performance Indicators: Students who demonstrate this understanding can:

7.EC.5A.1 Develop and use models to describe the characteristics of the levels of organization within ecosystems (including species, populations, communities, ecosystems, and biomes).

7.EC.5A.2 Construct explanations of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics of an ecosystem using evidence from soil profiles.

7.EC.5A.3 Analyze and interpret data to predict changes in the number of organisms within a population when certain changes occur to the physical environment (such as changes due to natural hazards or limiting factors).

7.EC.5B. Conceptual Understanding: Organisms in all ecosystems interact with and depend upon each other. Organisms with similar needs compete for limited resources. Food webs and energy pyramids are models that demonstrate how energy is transferred within an ecosystem.

Performance Indicators: Students who demonstrate this understanding can:

7.EC.5B.1 Develop and use models to explain how organisms interact in a competitive or mutually beneficial relationship for food, shelter, or space (including competition, mutualism, commensalism, parasitism, and predator-prey relationships).

7.EC.5B.2 Develop and use models (food webs and energy pyramids) to exemplify how the transfer of energy in an ecosystem supports the concept that energy is conserved.

7.EC.5B.3 Analyze and interpret data to predict how changes in the number of organisms of one species affects the balance of an ecosystem.

7.EC.5B.4 Define problems caused by the introduction of a new species in an environment and design devices or solutions to minimize the impact(s) to the balance of an ecosystem.