Fifth Grade

South Carolina fifth-grade students engage in thinking and solving problems the way scientists and engineers do to help them better see how science is relevant to their lives. To capitalize on the natural curiosity all students have about the world around them, learning experiences are built around the three dimensions of science: **Science and Engineering Practices (SEPs)**, **Crosscutting Concepts (CCCs)**, and **Disciplinary Core Ideas (DCIs)**. This three-dimensional approach to teaching and learning helps educators provide meaningful learning experiences that offer varied entry points for students from diverse backgrounds.

The performance expectations in fifth grade help students engage in inquiry questions such as, **but not limited to:**

When matter changes, does its weight change?
Students describe that matter is made of particles too small to be seen through the development of a model. Students also measure and graph quantities to develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved.

How much water can be found in different places on Earth?
Students describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact through the development of a model. They describe and graph data to provide evidence about the distribution of water on Earth.

How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?
Students support an argument with evidence and represent data in graphical displays to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

How does matter cycle through ecosystems and where does the energy in food come from and what is it used for?
Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun.

Can new substances be created by combining other substances?
Students make observations and measurements to determine whether the mixing of two or more substances results in new substances.

How can we protect the Earth's resources and environment?
Students evaluate solutions for local communities to protect the Earth's resources and environment.

***The PEs should be bundled to design classroom experiences. There are multiple ways to bundle the PEs to help students lead inquiry and see connections between ideas, and help teachers facilitate phenomenon-driven learning with efficient use of instructional time.**

Fifth Grade

Through the fifth-grade performance expectations, students demonstrate grade-appropriate proficiency in each of three dimensions. When students explore **Disciplinary Core Ideas** (Dimension 3), they will do so by engaging in **Science and Engineering Practices** (Dimension 1) and should be supported in making connections to the **Crosscutting Concepts** (Dimension 2) to link their understanding across the four disciplinary core domains.

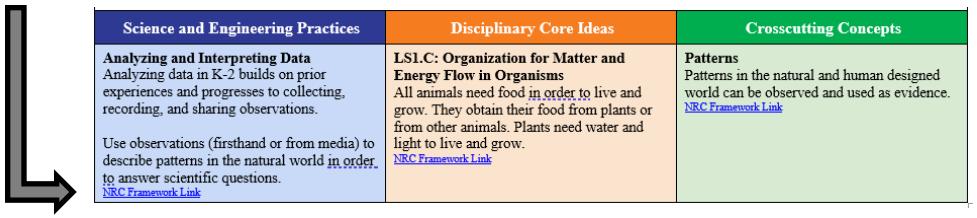
Each performance expectation contains one **SEP** and one **CCC** to be assessable and represents the student performance goal for the end of instruction; however, other **SEPs** and **CCCs** should be applied by students to support their progress leading up to the end of instruction. In fifth grade, these **end-of-instruction SEPs**, **DCIs**, and **CCCs** include:

SEPs	DCIs	CCCs
• Developing and Using Models • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Using Mathematics and Computational Thinking • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information	• Physical Science (PS1, PS2, PS3) • Life Science (LS1, LS2) • Earth and Space Science (ESS1, ESS2, ESS3) • Engineering, Technology, and Applications of Science (ETS1, ETS2)	• Patterns • Cause and Effect • Scale, Proportion, and Quantity • Systems and System Models • Energy and Matter

Hyperlinks within the Standards Document

SC Conceptual Vertical Articulation links: Hover over the above underlined and hyperlinked titles to view links for all SEPs, DCIs, and CCCs.

A Framework for K-12 Science Education links: Hover over titles found within the foundation boxes under each PE to link the guiding research for all SEPs, DCIs, and CCCs.



Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. NRC Framework Link	**LS1.C: Organization for Matter and Energy Flow in Organisms** All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. NRC Framework Link	**Patterns** Patterns in the natural and human designed world can be observed and used as evidence. NRC Framework Link

*Equity in science education requires that all students are provided with equitable opportunities to learn science and become engaged in science and engineering practices; with access to quality space, equipment, and teachers to support and motivate that learning and engagement; and adequate time spent on science. In addition, the issue of connecting to students' interests and experiences is particularly important for broadening participation in science (NRC Framework, p. 28).

Matter and Its Interactions (PS1)		
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. ***Clarification Statement:*** *Examples of evidence supporting a model could include adding air to expand a basketball, dissolving and evaporating salt water, and effects of air particles on larger objects such as leaves.* ***State Assessment Boundary:*** *Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena. NRC Framework Link	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space (and can be detected by their impact on other objects) can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. NRC Framework Link	**Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large. NRC Framework Link

Matter and Its Interactions (PS1)		
5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. ***Clarification Statement:*** *Examples of reactions or changes could include phase changes over time, dissolving, mixing that form new substance, and weighing substances before and after changes.* ***State Assessment Boundary:*** *Assessment does not include distinguishing mass and weight.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Measure and graph quantities such as weight to address scientific and engineering questions and problems. NRC Framework Link	**PS1.A: Structure and Properties of Matter** The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. NRC Framework Link **PS1.B: Chemical Reactions** No matter what reaction or change in properties occurs, the total weight of the substances does not change. NRC Framework Link **ETS2.A: Interdependence of Science, Engineering, and Technology** Tools and instruments (e.g., scales, thermometers, graduated cylinders) are used in scientific exploration to gather data and help answer questions about the natural world. NRC Framework Link	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. NRC Framework Link

Matter and Its Interactions (PS1)

5-PS1-3. Make observations and measurements to identify materials based on their properties.

Clarification Statement: *Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, and reflectivity; density is not intended as an identifiable property.*
State Assessment Boundary: *Assessment does not include density or distinguishing mass and weight.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. NRC Framework Link	**PS1.A: Structure and Properties of Matter** Measurements of a variety of properties can be used to identify materials. At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation. NRC Framework Link **ETS2.A: Interdependence of Science, Engineering, and Technology** Tools and instruments (e.g., scales, thermometers, graduated cylinders) are used in scientific exploration to gather data and help answer questions about the natural world. NRC Framework Link	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. NRC Framework Link

Matter and Its Interactions (PS1) 5		
5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances. ***State Assessment Boundary:*** *Mass and weight are not distinguished.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. NRC Framework Link	**PS1.B: Chemical Reactions** When two or more different substances are mixed, a new substance with different properties may be formed. NRC Framework Link	**Cause and Effect** Cause-and-effect relationships are routinely identified, tested, and used to explain change. NRC Framework Link

Motion and Stability: Forces and Interactions (PS2)		
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. ***Clarification Statement:*** *"Down" is a local description of the direction that points toward the center of the spherical Earth.* ***State Assessment Boundary:*** *Assessment does not include mathematical representation of gravitational force.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model. NRC Framework Link	**PS2.B: Types of Interactions** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. NRC Framework Link	**Cause and Effect** Cause-and-effect relationships are routinely identified and used to explain change. NRC Framework Link

Energy (PS3) 5		
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. ***Clarification Statement:*** *Examples of models could include food webs or diagrams and flowcharts to illustrate the flow of energy.* ***State Assessment Boundary:*** *Assessment does not include cellular mechanisms of digestive absorption.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Use models to describe phenomena. NRC Framework Link	**PS3.D: Energy in Chemical Processes and Everyday Life** The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). NRC Framework Link **LS1.C: Organization for Matter and Energy Flow in Organisms** Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. *(secondary)* NRC Framework Link	**Energy and Matter** Energy can be transferred in various ways and between objects. NRC Framework Link

From Molecules to Organisms: Structures and Processes (LS1) 5		
5-LS1-1. Support an argument with evidence that plants obtain materials they need for growth mainly from air and water. ***Clarification Statement:*** *Without inputs of energy (sunlight) and matter (carbon dioxide and water), a plant cannot grow. Evidence could be drawn from diagrams, models, and data that are gathered from investigations.* ***State Assessment Boundary:*** *Assessment does not include molecular explanations of photosynthesis.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model. NRC Framework Link	**LS1.C: Organization for Matter and Energy Flow in Organisms** Plants acquire their material for growth chiefly from air and water. NRC Framework Link	**Energy and Matter** Matter is transported into, out of, and within systems. NRC Framework Link

Ecosystems: Interactions, Energy, and Dynamics (LS2)

5

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Clarification Statement: *Emphasis is on the idea that matter that is not food (such as air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.*
State Assessment Boundary: *Assessment does not include molecular explanations.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3-5 builds on K-2 models and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena. NRC Framework Link	**LS2.A: Interdependent Relationships in Ecosystems** The food of almost any kind of animal can be traced back to plants (producers). Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants (either way they are consumers). Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. NRC Framework Link (continued on next page)	**Systems and System Models** A system can be described in terms of its components and their interactions. NRC Framework Link

	LS2.B: Cycles of Matter and Energy Transfer in Ecosystems Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. NRC Framework Link	

Earth's Place in the Universe (ESS1)		
5-ESS1-1. Support an argument with evidence that the apparent brightness of the sun compared to other stars is due to their relative distances from Earth. ***Clarification Statement:*** *Evidence could be drawn from various media, diagrams, models, or data that are gathered from investigations.* ***State Assessment Boundary:*** *Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness such as stellar masses, age, and stage.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model. NRC Framework Link	**ESS1.A: The Universe and Its Stars** The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. NRC Framework Link	**Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large. NRC Framework Link

Earth's Place in the Universe (ESS1)

5

5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Clarification Statement: *Patterns could be revealed from graphical interpretations, various media, diagrams, models, or graphs constructed from data gathered from investigations. Examples of patterns could include the position and motion of Earth with respect to the sun or selected stars that are visible only in particular months.*
State Assessment Boundary: *Assessment does not include causes of seasons or labeling specific phases of the moon.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. NRC Framework Link	**ESS1.B: Earth and the Solar System** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. NRC Framework Link	**Patterns** Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena. NRC Framework Link

Earth's Systems (ESS2) 5		
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. ***Clarification Statement:*** *Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.* ***State Assessment Boundary:*** *Assessment is limited to the interactions of two systems at a time.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model using an example to describe a scientific principle. NRC Framework Link	**ESS2.A: Earth Materials and Systems** Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. NRC Framework Link	**Systems and System Models** A system can be described in terms of its components and their interactions. NRC Framework Link

Earth's Systems (ESS2) 5		
5-ESS2-2. Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. ***State Assessment Boundary:*** *Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Using Mathematics and Computational Thinking Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Describe and graph quantities such as area and volume to address scientific questions. NRC Framework Link	**ESS2.C: The Roles of Water in Earth's Surface Processes** Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. NRC Framework Link	**Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight and volume. NRC Framework Link

Earth and Human Activity (ESS3) 5		
5-ESS3-1. Evaluate potential solutions to problems that individual communities face in protecting the Earth's resources and environment.		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3-5 builds on K-2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. NRC Framework Link	**ESS3.C: Human Impacts on Earth Systems** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. NRC Framework Link **ETS1.B: Developing Possible Solutions** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. NRC Framework Link **ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World** Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. NRC Framework Link	**Systems and System Models** A system can be described in terms of its components and their interactions. NRC Framework Link