Sixth Grade

South Carolina sixth-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 providq0 0 792 61 (h t)-2.005 (o t

Sixth Grade

Through the sixth-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 sixth 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 Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	Physical Science (PS1, PS3, PS4) Life Science (LS1) 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 • Structure and Function

	PS3.A: Definitions of Energy language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning, it refers to the energy transferred due to the temperature difference between two objects. (*secondary*) The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block relationship depend on the type of atom or molecule and the interactions among the atoms in the material. (*secondary*) Temperature is not a direct measure of a

Energy (PS3)

6-PS3-3. Apply scientific principles to design, construct, and test a devic thermal energy transfer.

Clarification Statement: *Examples of devices could include an insulated box, a solar cooker, an*
State Assessment Boundary: *Assessment does not include calculating the total amount of therm*

Science and Engineering Practices	Disciplinary Core Ideas
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. NRC Framework Link	**PS3.A: Definitions of Energy** refers both to thermal energy (the motion of atoms or molecules within a substance) and energy transfers by convection, conduction, and radiation (particularly infrared and light). NRC Framework Link **PS3.B: 11.04 Tf.7 12.(eak)]TETET35 21.7774 BD**

	ETS1.A: Defining and Delimiting an Engineering Problem

Energy (PS3)

6-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

Clarification Statement: *Examples of experiments could include comparing final water temperatures after different masses of ice melted in*

Waves and Their Applications in Technologies for Information Transfer (PS4)		
6-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. ***Clarification Statement:*** *Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.* ***State Assessment Boundary:*** *Assessment is limited to qualitative applications pertaining to light and mechanical waves.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 6-8 builds on K-5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena. NRC Framework Link	**PS4.A: Wave Properties** A sound wave needs a medium through which it is transmitted. NRC Framework Link **PS4.B: Electromagnetic Radiation** When light shines on an object, it is reflected, absorbed, or transmitted through the object,	

From Molecules to Organisms: Structures and Processes (LS1)		
6-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. ***Clarification Statement:*** *Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.* ***State Assessment Boundary:*** *Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 6-8 builds on K-5 experiences		

Systems (ESS2)	6	
6-ESS2-1. Develop a model to describe the cycling of the flow of energy that drives this process. ***Clarification Statement:*** *Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act* ***State Assessment Boundary:*** *Assessment does not include the identification and naming of minerals.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena. NRC Framework Link	**ESS2.A: Earth Materials and Systems** All Earth processes are the result of energy flowing and matter cycling within and among energy that flows and matter that cycles produce chemical and physical changes in organisms. NRC Framework Link	**Energy and Matter** Within a natural or designed system, the transfer of energy drives the motion/and or cycling of matter. NRC Framework Link

Systems (ESS2)

6-ESS2-2. Construct an explanation based on evidence for how at varying time and spatial scales.

Clarification Statement: *Emphasis is on how*
motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually, but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.
State Assessment Boundary: *Assessment does not include identification or naming of specific events.*

	 **ETS2.A: Interdependence of Science, Engineering, and Technology** Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. NRC Framework Link	

Systems (ESS2)		
6-ESS2-4. Develop a model to describe **driven by energy from the sun and the force of gravity.** ***Clarification Statement:*** *Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.* ***State Assessment Boundary:*** *Assessment does not include a quantitative understanding of the latent heats of vaporization and fusion.*		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to describe unobservable mechanisms. NRC Framework Link	**Surface Processes**	

Systems (ESS2)

6-ESS2-5. Analyze and interpret data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

Clarification Statement: *Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).*

State Assessment Boundary: *Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to provide evidence for phenomena. NRC Framework Link	**ESS2.C: The Roles of Water in Earth's Surface Processes** The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. NRC Framework Link **ESS2.D: Weather and Climate** Because these patterns are so complex, weather can only be predicted probabilistically. NRC Framework Link	**Cause and Effect** Cause-and-effect relationships may be used to predict phenomena in natural or designed systems. NRC Framework Link

Earth and Human Activity (ESS3)