Crosscutting Concepts from the Framework for K-12 Science Education

Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

K-2	3-5	6-8
• Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). • Standard units are used to measure length.	• Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.	• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. • The observed function of natural and designed systems may change with scale. • Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. • Scientific relationships can be represented through the use of algebraic expressions and equations. • Phenomena that can be observed at one scale may not be observable at another scale.

Crosscutting Concepts from the Framework for K-12 Science Education

Structure and Function: The way an object is shaped or structured determines many of its properties and functions.

K-2	3-5	6-8
• The shape and stability of structures of natural and designed objects are related to their function(s).	• Different materials have different substructures, which can sometimes be observed. • Substructures have shapes and parts that serve functions	• 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. • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.