NGSS Crosscutting concepts: Summary K-2, 3-5

Crosscutting concept	K-2 Crosscutting statements	3-5 Crosscutting statements
Patterns Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.	Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	• Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.
Cause and effect Events have causes, sometimes simple, sometimes multifaceted. Deciphering natural causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.	• Events have causes that generate observable patterns. • Simple tests can be designed to gather evidence to support or refute student ideas about causes	• Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.
Scale, Proportion and Quantity In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.	• 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.

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System and System Models A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.	• Objects or organisms can be described in terms of their parts. • Systems in the natural and designed world have parts that work together.	• A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and its interactions.
Energy and Matter Tracking energy and matter flows, into, out of, and within systems helps one understand the system's behavior.	• Objects may break into smaller pieces, be put together into larger pieces, or change shape.	• Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substance before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. •Energy can be transferred in various ways and between objects.
Structure and Function The way an object is shaped or structured determines many of its properties and functions.	• 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.
Stability and Change For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.	• Some things stay the same while other things change. • Things may change slowly or rapidly.	• Change is measured in terms of differences over time and may occur at different rates. • Some systems appear stable, but over long periods of time will eventually change.