

This resource addresses the recurring themes and concepts through the lenses of both scientists and engineers. Scientists seek to develop scientific explanations, and engineers seek to develop designed solutions. The recurring themes and concepts provide a connective structure that supports students' understanding of science and the application of science through engineering.

The K-8 recurring themes and concepts strand introduces and spirals the recurring themes throughout each grade level's Texas Essential Knowledge and Skills (TEKS). In high school, the recurring themes and concepts connections are addressed more broadly to include structure and function, systems, models, and patterns. The high school course introductions explain that all systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. Models have limitations but provide a tool for understanding the ideas presented. Scientists and engineers analyze a system in terms of its components and how they relate to each other, the whole, and the external environment.

## Patterns

Patterns are regular sequences that can be found throughout nature.

### Scientists

Scientists questions may be generated when scientists observe a pattern of events or when something does not match an established pattern. Scientists can use patterns to classify object





## Matter & Energy

Matter is a material substance that occupies space, has mass, and is composed predominantly of microscopic particles. Matter can be understood in terms of the types of particles present and their interactions. Energy is a measurable quantity that describes how much change can occur within a system.

### Scientists

Scientists investigate the flow and interactions of matter and energy. The states, properties, and reactions of matter can be described and predicted based on the types, interactions, and motions of atoms. Energy manifests in multiple phenomena, such as motion, light, sound, electrical and magnetic fields, and thermal energy. Energy can be modeled as either motion of particles or as stored in force fields (electric, magnetic, gravitational) that mediate interactions between particles. The total energy in a system does not change but can be transferred between objects within the system.

### Engineers

Considering energy and matter inputs, outputs, and flows or transfers within a system or process is equally important for engineering. A goal in engineering design is to maximize certain types of energy output while minimizing others and optimizing energy inputs needed to achieve the desired task. For example, engineers might develop ways to transform wind and wave energy at sea into usable electricity for people in coastal regions and beyond.

## Structure and Function

A structure is something arranged in a definite pattern of organization; the arrangement of particles or parts in a substance or body; the aggregate of elements of an entity in their relationships to each other. A function is the purpose or reason an object exists in a system. How a structure functions, whether natural or designed by humans, depends on how essential parts are shaped and the relationships between those parts

### Scientists

Scientists seek to understand how the structure of an organism or type of matter is related to how it behaves or what it does. The functioning of natural systems