**Patterns**

**Definition –**

* A form or model proposed for imitation
* Used as a model
* Reliable sample of traits, acts, tendencies, or other observable characteristics
* A discernible coherent system based on the intended interrelationship of component parts
* A frequent or widespread incidence

**Useful to Scientists and Engineers -**

* Organize information
* Classify things
* Recognize relationships
* Identify factors that affect the things we observe

**Closely Related Science and Engineering Practices –**

* Analyzing and Interpreting Data
* Using Mathematics and Computational Thinking

**Cause and Effect**

**Definition –**

* Cause – something or someone that produces an effect, result, or condition.
* Effect – a change that results when something is done or happens: an event, condition, or state of affairs that is produced by a cause.

**Useful to Scientists and Engineers–**

* Events can have simple or complex causes. Scientists look for relationships between what causes something to happen and what happens as a result in order to predict and test new events.

**Closely Related Science and Engineering Practices –**

* Planning and Carrying Out Investigations
* Engaging in Argument from Evidence

**Scale, Proportion, and Quantity**

**Definition-**

* Scale – a series of marks or points at known intervals used to measure.
* Proportion – the relationship that exists between the size, number, or amount of two things.
* Quantity – the amount or number of something.

**Useful to Scientists and Engineers–**

* Changes in scale proportion or quantity can affect the structure of a system or the way it performs.

**Closely Related Science and Engineering Practices –**

* Using Mathematics and Computational Thinking
* Analyzing and Interpreting Data
* Developing and Using Models

**Systems and System Models**

**Definition –**

* Systems are made of many parts and the parts may influence each other.
* A part that is broken, missing, mismatched, or not connected may cause the system to cease functioning.
* When thinking about a system, it is important to recognize how all the parts are related to each other.
* Any system is usually connected to other systems.

**Useful to Scientists and Engineers –**

* Identifying the boundaries of a system and modeling the interaction between the parts of a system help us understand and test ideas.

**Closely Related Science and Engineering Practices –**

* Developing and Using Models

**Energy and Matter: Flows, Cycles, and Conservation**

**Definition –**

* Energy – The ability to do scientific work
* Matter – Any object that has mass and volume

**Useful to Scientists and Engineers –**

* Tracing matter and energy as it moves into, out of, and throughout a system helps us better understand the system and its limitations.

**Closely Related Science and Engineering Practices -**

* Constructing explanations (for science) and designing solutions (for engineering)
* Obtaining, evaluating, and communicating information

**Structure and Function**

**Definition –**

* Structure – the arrangement of and relations between the parts or elements of something complex
* Function – work or operate in a proper or particular way

**Useful to Scientists and Engineers –**

* The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

**Closely Related Science and Engineering Practices –**

* Developing and Using Models
* Asking questions (for science) and defining problems (for engineering).

**Stability and Change**

**Definition-**

* Stability – the quality or state of something that is not easily changed or likely to change.
* Change – to become different

**Useful to Scientists and Engineers-**

* Understanding science involves examining how things change and how some things stay the same, even in the midst of change.

**Closely Related Science and Engineering Practices –**

* Planning and Carrying Out Investigations
* Developing and Using Models
* Using mathematics and computational thinking