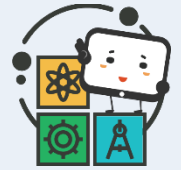




# A GUIDE TO CROSS-CUTTING CONCEPTS

*Cross-cutting concepts are a set of overarching big ideas that look and behave similarly across all STEM (science, technology, engineering, and math) domain areas.*



In this document, we define and describe cross-cutting concepts in STEM learning for all young children, including children with disabilities. We provide definitions, examples and learning progression steps of each cross-cutting concept.



## Learning Progression

A child’s progression of learning, or how their STEM (science, technology, engineering, and math) knowledge develops, is cultivated through their experiences, observations, and guidance from people in their environments.

## Cross-Cutting Concepts

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## Cause & Effect

The relationship between two actions and/or events where action/event A (cause) makes action/event B (effect) happen or where action/event B is the result of action/event A

- *Controlling lights/or sounds for an effect*
- *Changing the slope of a ramp for the car to go faster*
- *Designing an experiment to test hypothesis – bubble blowing (change bubble wants to see different bubbles)*



### LEARNING PROGRESSION STEPS

Repeats actions to make things happen

Notices effect of oneself on the environment

Performs simple actions

Shows awareness that something made something happen

Investigates changes "what happens when..."

Notices effects of others on the environment

Combines simple actions to explore cause and effect

Suggests what might happen

Expresses that something made something else happen

Notices relationships between three or more events

Describes multiple-way causality

Describes one-way causality

Describes three-step causality

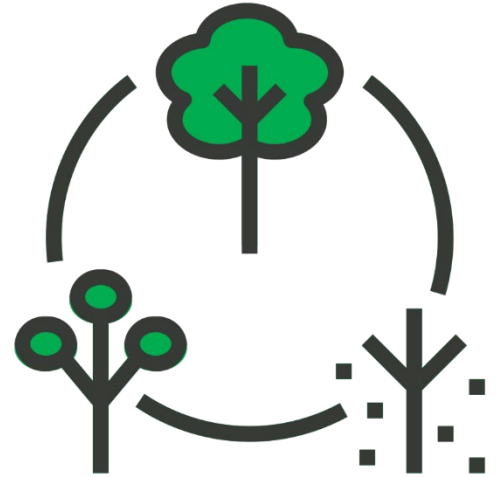


## Change & Stability

Change is when something becomes different, or its original state is altered either quickly or slowly.

Stability is when something remains the same or is resistant to change.

- *Mixing dirt and water to make mud*
- *Folding a flat sheet of paper into an airplane*
- *Noticing the green leaves turning different colors in the fall*
- *Understanding that the weather can be different from day to day*
- *Rolling playdough into a worm or ball shape*



### LEARNING PROGRESSION STEPS

Reacts to obvious immediate or spontaneous change

Reacts to change within a limited time frame

Reacts to obvious gradual change

Reacts to broader/future time frame change



## Compare & Contrast

To describe or document the similarities (compare) and differences (contrast) between two or more things (e.g., ideas, objects, places)

- *Using a Venn diagram to document the similarities and differences of trees and flowers*
- *Recognizing plants and animals grow while rocks do not*
- *Communicating why they think blocks make a better tower than spheres*
- *Sorting fallen leaves by color, shape, and/or size*



### LEARNING PROGRESSION STEPS

Notices similarities and differences in objects based on attributes related to senses

Notices similarities and differences in objects based on attributes related to structure

Notices similarities and differences in objects based on attributes related to function

Recognizes similarities and differences in objects based on attributes related to senses

Recognizes similarities and differences in objects based on attributes related to structure

Recognizes similarities and differences in objects based on attributes related to function

Identifies similarities and differences in objects based on attributes related to senses

Identifies similarities and differences in objects based on attributes related to structure

Identifies similarities and differences in objects based on attributes related to function

Describes similarities and differences between objects or events in detail

Describes similarities and differences between objects or events over time

Compares and contrasts objects or events using evidence such as basic similarities and differences

## Patterns

When something repeats in a predictable manner (e.g., seasons, Fibonacci shell, ocean tides)

- *Recognizing visual patterns in the natural world (day/night)*
- *Generating visual programming with blocks to create patterns that can be replicated*
- *Knowing to use the bathroom and brush teeth upon waking, then have breakfast and go to school*



### LEARNING PROGRESSION STEPS

Describes symmetry in chunks of information

Notices symmetry in chunks of information

Duplicates any chunk of information that repeats

Identifies the chunk of information that repeats

Recognizes a chunk of information that repeats

Identifies a hidden pattern



## Structure & Function

Structure is the shape or form of an object or thing, and function is the structure's purpose or what action it performs

- *Designing a tower of blocks that can withstand the wind*
- *Understanding that a spoon is needed for soup instead of a fork*
- *Knowing a vehicle is needed to reach places far away*
- *Understanding that a rabbit's legs help it hop fast*



### LEARNING PROGRESSION STEPS

Notices properties of objects and living things based on attributes

Notices properties of objects and living things based on structure

Notices properties of objects and living things based on function

Recognizes properties of objects and living things based on attributes

Recognizes properties of objects and living things based on function

Recognizes properties of objects and living things based on structure

Identifies properties of objects and living things based on attributes

Identifies properties of objects and living things based on structure

Identifies properties of objects and living things based on function

Identifies how an object's structure affects how well it works for a specific purpose (function)

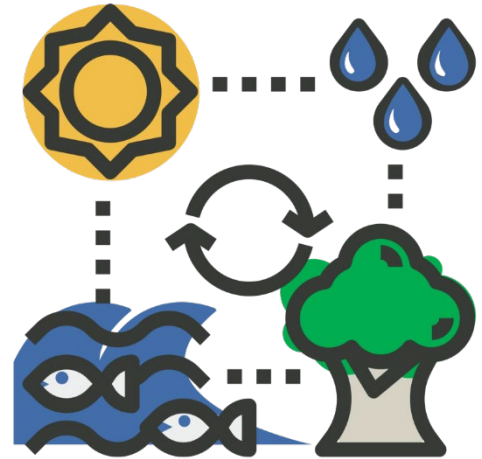
Identifies how an object's properties affect how well it works for a specific purpose (function)



## Systems & Their Interactions

Systems in the natural or design world made of parts or smaller things that work together

- *Designing a habitat for class pet (including appropriate structures based upon the needs of the animal)*
- *Learning about how recycling helps the environment*
- *Creating a visual drawing of a building and telling a friend how to build it out of popsicle sticks*



### LEARNING PROGRESSION STEPS

Considers limited anticipated impacts of changing something on something else

Considers more extensive anticipated impacts of changing something on something else

Considers unexpected/unique impacts of systems and their interactions