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)

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**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

<table>
<thead>
<tr>
<th>Reacts to obvious immediate or spontaneous change</th>
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<tbody>
<tr>
<td>Reacts to change within a limited time frame</td>
</tr>
<tr>
<td>Reacts to obvious gradual change</td>
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<tr>
<td>Reacts to broader/future time frame change</td>
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**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

<table>
<thead>
<tr>
<th>Considers limited anticipated impacts of changing something on something else</th>
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</thead>
<tbody>
<tr>
<td>Considers more extensive anticipated impacts of changing something on something else</td>
</tr>
<tr>
<td>Considers unexpected/unique impacts of systems and their interactions</td>
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