

# Supporting Crosscutting Concepts K-5

The crosscutting concepts (CCC) span all science courses K-12. This document contains a short explanation of each crosscutting concept and ideas that can be used to support students when building knowledge around each CCC in the science classroom. Students may need support to allow them to be successful in interacting with the science content and the crosscutting concepts are one part of providing that support to students. This document is designed to provide suggestions for how students can interact with the science and engineering practices. This document also provides support suggestions to assist students as they interact with the CCCs.

## Tips for including the Crosscutting Concepts

- Start every lesson with a phenomenon that students can “figure out” as they work through the lesson
- Include a science and engineering practice in every lesson to assist students in “figuring out” a phenomena
- The crosscutting concepts are designed to assist students in organizing information. It is essential that students be aware of the crosscutting concept so that it becomes part of their toolkit when examining any science concept.
- Include the crosscutting concept within the lesson as a lens that students are viewing the material through.
- Always use the crosscutting concepts in context with a science and engineering practice and a disciplinary core idea.
- The crosscutting concepts should be used to deepen student understanding of the disciplinary core ideas.
- Obtain, evaluate, and communicate will easily align with all the crosscutting concepts.

## Patterns

Crosscutting concept	Prompts to elicit student thinking about various phenomena	Science and engineering practices that most easily align
<b>Patterns</b> Observed repeated similarities in the natural and designer world around us. This crosscutting concept can be used to classify information about the world and universe around us, ask questions about the relationships and causes of phenomena.	<ul style="list-style-type: none"> <li>• What patterns did you notice?</li> <li>• Can you describe the pattern?</li> <li>• What predictions can you make based on the pattern?</li> <li>• What is the same? What is different?</li> <li>• What comes next? Does it repeat?</li> <li>• How do you know a _____ when you see one? What are _____ characteristics?</li> </ul>	<ul style="list-style-type: none"> <li>• Analyzing and interpreting data</li> <li>• Mathematical and computational thinking</li> </ul>
		<b>Sentence Frames for Student Use</b>
		<ul style="list-style-type: none"> <li>• The pattern that I noticed is _____.</li> <li>• From the pattern _____ I predict _____ because _____</li> </ul>



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## Causality

Crosscutting concept	Prompts to elicit student thinking about various phenomena	Science and engineering practices that most easily align
<b>Cause and Effect</b> Events have causes and effects on the world around them. The causes and effects of an event can be used to link occurrences together and predict what will occur after an event. Determining the cause and/or effect is a major activity of science and engineering.	<ul style="list-style-type: none"> <li>What happened? Why did it happen?</li> <li>What is causing this to happen?</li> <li>Can you make it happen again?</li> <li>Can you show that this caused ...?</li> <li>Can you identify the cause and the effect?</li> <li>How can you show that this caused...?</li> </ul>	<ul style="list-style-type: none"> <li>Planning and carrying out investigations</li> <li>Engaging in argument from evidence</li> </ul>
		<p style="text-align: center;"><b>Sentence Frames for Student Use</b></p> <ul style="list-style-type: none"> <li>One cause of _____ might be _____.</li> <li>_____ caused _____. The evidence to support this is _____.</li> </ul>
<b>Structure and Function</b> Connecting the structure of an object/system with the function. This can include looking at the structures, substructure and shapes of an object or system to determine how or why it functions within a given environment.	<ul style="list-style-type: none"> <li>How does the shape (or structure) of _____ make it work better?</li> <li>What material is best to _____? Why?</li> <li>How can this structure be improved?</li> <li>What is the purpose of _____?</li> <li>How is the structure related to the function?</li> </ul>	<ul style="list-style-type: none"> <li>Ask questions and identify problems</li> <li>Develop and use models</li> <li>Construct and explanation</li> </ul>
		<p style="text-align: center;"><b>Sentence Frames for Student Use</b></p> <ul style="list-style-type: none"> <li>The important structures of _____ are _____.</li> <li>The _____ (structure) of a _____ is for _____ (function).</li> </ul>



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## Systems

Crosscutting concept	Prompts to elicit student thinking about various phenomena	Science and engineering practices that most easily align
<b>Scale, Proportion and Quantity</b> Everything in the universe has an element of scale, proportion, or quantity. This may be related to energy, size, time, or measurement.	<ul style="list-style-type: none"> <li>Which is bigger/smaller? How much larger/smaller?</li> <li>Which is hotter/cooler? What is the difference in temperature?</li> <li>Which happens faster/slower? What is the difference in time?</li> <li>How long does it take?</li> <li>How can you measure that? What tool and units will you use?</li> <li>What measurement could you take?</li> </ul>	<ul style="list-style-type: none"> <li>Analyzing and interpreting data</li> <li>Mathematical and computational thinking</li> <li>Developing and using models</li> </ul>
		<b>Sentence Frames for Student Use</b>
		<ul style="list-style-type: none"> <li>_____ was (bigger/smaller/heavier...) than_____.</li> <li>I used _____ units to measure because_____.</li> </ul>
<b>Stability and Change</b> Make sense of why some natural and human-designed systems are stable and why some change.	<ul style="list-style-type: none"> <li>What is changing or staying the same?</li> <li>Describe if the change is slow or fast?</li> <li>How often does this change?</li> <li>How long did that take?</li> <li>Do you notice a pattern to the change?</li> <li>Is that stable?</li> <li>What could you change to make this better?</li> </ul>	<ul style="list-style-type: none"> <li>Develop and use models</li> <li>Construct an explanation</li> </ul>
		<b>Sentence Frames for Student Use</b>
		<ul style="list-style-type: none"> <li>The system appears stable because _____.</li> <li>I claim_____ is changing/staying the same because our evidence shows_____.</li> <li>Over a long period of time _____ stays the same/changes because_____.</li> </ul>



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## Systems

Crosscutting concept	Prompts to elicit student thinking about various phenomena	Science and engineering practices that most easily align
<b>Energy and Matter</b> All things in the universe require energy to function or move. All things in the universe are made of matter. Energy and matter meet when matter is used to make energy.	<ul style="list-style-type: none"> <li>What are the properties of _____?</li> <li>Do the properties stay the same? How are they different?</li> <li>Can you break it into smaller pieces?</li> <li>Can you put it back together again? How?</li> <li>What is the weight before and after?</li> <li>How was the energy transferred?</li> <li>How is the energy moving in/out/within/between an object(s)?</li> </ul>	<ul style="list-style-type: none"> <li>Develop and use models</li> <li>Construct an explanation</li> <li>Construct an argument</li> </ul>
		<p style="text-align: center;"><b>Sentence Frames for Student Use</b></p> <ul style="list-style-type: none"> <li>I claim that _____ (matter) changed because _____.</li> <li>I noticed evidence of energy when _____ happened.</li> </ul>
<b>Systems and System Models</b> This crosscutting concept is about examining smaller pieces of the whole to make sense of larger connections in the universe. A system is anything that consists of interacting components within a boundary. A system can be open or closed. Systems can be naturally occurring or human designed.	<ul style="list-style-type: none"> <li>What are the parts that make this up?</li> <li>What do the parts do?</li> <li>How do the parts work together?</li> <li>Can you draw a model of the system?</li> <li>What process is occurring?</li> <li>Can you describe the system?</li> </ul>	<ul style="list-style-type: none"> <li>Developing and using models</li> <li>Analyzing and interpreting data</li> <li>Constructing an explanation</li> <li>Plan and carry out investigations</li> </ul>
		<p style="text-align: center;"><b>Sentence Frames for Student Use</b></p> <ul style="list-style-type: none"> <li>The system parts are _____.</li> <li>The system parts such as _____, _____, _____ work together to _____.</li> <li>In this system _____ interacts with _____ to cause _____.</li> </ul>



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