

Project Name: Understanding Crosscutting Concepts (CCCs)

Project Type: Rise eLearning course

**Course Settings:**

Theme: Include Wieserlearningsolutions logo.

Navigation: Free                      Sidebar Open initially

Headings Font: Lato                      Body Font: Roboto

Include Cover photo and include in sidebar. Text contrast 10%

Custom Theme hex color #94D46C

Font side: Default                      Font color: Default

Lesson 6: Systems and System Models

Lesson	Lesson 6: Systems and System Models			Block Type	Quote
Block #	1	Title:	Intro quote	Style	
Name:		Avatar:		A	
Content:	Quote: "Any model of a system incorporates assumptions and approximations; the key is to be aware of what they are and how they affect the model's reliability and precision."  Name: Framework, page 93			B	
				C	
				D	
				Quote on image	x
			Quote carousel		
			Settings		
			Padding top	30px	
			Padding bottom	30 px	
			Background color hex	FFFFFF	
			Font size		
			Font color		

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Lesson	Lesson 6: Systems and System Models			Block Type:	Text
Block #	2	Title:	Systems and System Models	Style	
Content:				Paragraph	
A system is an organized group of related objects or components that form a whole. When investigating systems, it's important to define the systems and the system boundaries. For more information on systems and system models, please see the <a href="#">Framework, pages 91-94</a> .				Paragraph with heading	x
Link: <a href="https://www.nap.edu/read/13165/chapter/8#91">https://www.nap.edu/read/13165/chapter/8#91</a>				Heading	
				Subheading	
				Two column	
				Table	
				Settings	
				Padding top	30px
				Padding bottom	30 px
				Background color hex	FFFFFF
				Font size	
				Font color	

Lesson	Lesson 6: Systems and System Models			Block Type:	Text
Block #	3	Title:	How can models make predictions about or explain each system?	Style	
Content:				Paragraph	
How can models make predictions about or explain each system?				Paragraph with subheading	
				Heading	
				Subheading	X
				Two column	
				Table	
				Settings	
				Padding top	30px
				Padding bottom	30 px
				Background color hex	FFFFFF
				Font size	
				Font color	

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Lesson	Lesson 6: Systems and System Models		Block Type:	Gallery
Block #	4	Title:	Style	
Image 1	Image of hurricane over ocean		Carousel	
Caption 1			Two column grid	
Image 2	Image of model of human heart		Three column grid	x
Caption 2			Four column grid	
Image 3	Image of galaxy			
Caption 3				
Image 4				
Caption 4			Settings	
Image 5			Padding top	30px
Caption 5			Padding bottom	30 px
Image 6			Background color hex	FFFFFF
Caption 6			Enable Zoom	Yes / No
Image 7				
Caption 7				

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Lesson	Lesson 6: Systems and System Models		Block Type:	Text
Block #	5	Title:	Style	
<p>Content:</p> <p>Systems and system models are useful in science and engineering because the world is complex. Even though many systems are part of a larger system, it is often easier to isolate a smaller system for the purpose of study. To do this, scientists establish boundaries for the system and determine the inputs and outputs that influence the workings of the system in the defined boundaries. Understanding the extent to that a system can be isolated or external conditions controlled is an important element of the design and how results are interpreted. The properties and behavior of the whole system can be very different from those of any of its parts, and large systems may have properties that cannot be predicted in detail from knowledge about the components and their interactions.</p> <p>This crosscutting concept connects to the practice of <a href="#">Developing and Using Models</a>. Models can be valuable in predicting a system’s behaviors, regardless of what type of system is being examined. In complex systems, it is important to ask what interactions are occurring (e.g., predator-prey relationships in an ecosystem) and to recognize that they all involve transfers of energy, matter, and (in some cases) information among parts of the system.</p> <p>This crosscutting concept also connects to the practices of <a href="#">Constructing Explanations and Designing Solutions</a> and <a href="#">Engaging in Argument from Evidence</a>. Any model of a system incorporates assumptions and approximations; the key is to be aware of what they are and how they affect the model’s reliability and precision. Predictions may be reliable but not precise or, worse, precise but not reliable; the degree of reliability and precision needed depends on how the model will be used.</p> <p>Links:  <a href="https://www.nap.edu/read/13165/chapter/7#56">https://www.nap.edu/read/13165/chapter/7#56</a>  <a href="https://www.nap.edu/read/13165/chapter/7#67">https://www.nap.edu/read/13165/chapter/7#67</a>  <a href="https://www.nap.edu/read/13165/chapter/7#71">https://www.nap.edu/read/13165/chapter/7#71</a></p>			Paragraph	x
			Paragraph with subheading	
			Heading	
			Subheading	
			Two column	
			Table	
			Settings	
			Padding top	30px
			Padding bottom	30 px
			Background color hex	FFFFFF
			Font size	
			Font color	

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Lesson	Lesson 6: Systems and System Models		Block Type:	Text
Block #	6	Title:	Progression of Learning	
<p>Content:</p> <p>A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. Properties and behaviors of the system can be different than those of the parts of the system. Some of the outcomes of the system are not predictable based on the interactions of the system.</p>			Style	
			Paragraph	
			Paragraph with subheading	x
			Heading	
			Subheading	
			Two column	
			Table	
			Settings	
			Padding top	30px
			Padding bottom	30 px
			Background color hex	FFFFFF
			Font size	
Font color				

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Lesson	Lesson 6: Systems and System Models		Block Type:	Accordion/Tabs
Block #	7	Title:	Style	
Item #1	Primary		Accordion	
Description	<p>In grades K-2, students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.</p> <p>Example: students use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.</p>		4	
Multimedia	Image of deer in forest		4	
Item #2	Elementary		Settings	
Description	<p>In grades 3-5, students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.</p> <p>Example: students explain how the types of plants and animals in a region may change when the environment changes.</p>		Padding top	30px
Multimedia	Image of forest after a fire		Padding bottom	30px
Item #1	Middle School		Background color hex	#94D469
Description	<p>In grades 6-8, students understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.</p> <p>Example: students demonstrate understanding that gravitational interactions within the solar system are attractive and depend on the masses of interacting objects.</p>		Enable Zoom	Yes
Multimedia	Image of satellite in space		Accordion behavior	Keep open
Item #1	High School			Only one
Description	<p>In grades 9-12, students investigate or analyze a system by defining its boundaries and initial conditions, as well as its inputs and outputs. They use models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales. They also use models and simulations to predict the behavior of a system and recognize that these predictions have limited precision and reliability due to the assumptions and approximations inherent in the models. They can also design systems to do specific tasks.</p>			

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	Example: students develop a model explaining the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.		
Multimedia	Image of plant s growing in flasks		

Lesson	Lesson 6: Systems and System Models		Block Type:	Divider
Block #	8		Settings	
Divider type	Divider	x	Padding top	30px
	Numbered divider		Padding bottom	30px
	Spacer		Background color hex	FFFFFF

Lesson	Lesson 6: Systems and System Models		Block Type:	Text	
Block #	9	Title: Implications for Instruction	Style		
Content: Click each of the markers below to reflect on key questions for integrating the crosscutting concept of systems and system models in your instruction.			Paragraph		
			Paragraph with subheading		
			Heading		
			Subheading		
			Two column		
			Table		
			Settings		
			Padding top	30px	
			Padding bottom	30px	
			Background color hex	FFFFFF	
Font size					
Font color					

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Lesson	Lesson 6: Systems and System Models		Block Type:	Labeled Graphic
Block #	10	Title:	Image width	
Item #1	Question 1		Small	
Description	Review the standards and curriculum you teach. Where are opportunities for your students to identify systems or system models to make sense of phenomena or explain their thinking?			x
Marker style	1		Medium	
Multimedia	Systemmapping.jpg		Full width	
Audio			Settings	
Item #2	Question 2		Padding top	30px
Description	Where in your current curriculum do students identify and use systems or system models to make sense of phenomena or explain their thinking?		Padding bottom	30px
Marker style	2		Background color hex	#F5F5F5
Multimedia				
Audio				
Item #3	Question 3			
Description	<p>What questions can you ask students to prompt them to identify systems or system models?</p> <p>What questions or prompts will help students use systems or system models to make sense of phenomena or support their thinking?</p>			
Marker style	3			
Multimedia				
Audio				
Item #4	Question 4			
Description	<p>Do your lessons elicit evidence that students:</p> <ul style="list-style-type: none"> <li>• identify boundaries of systems</li> <li>• identify inputs and outputs of a system</li> <li>• compare properties and behaviors of parts vs whole</li> <li>• use systems and system models to make predictions or support explanations</li> </ul>			
Marker style	4			
Multimedia				
Audio				



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Lesson	Lesson 6: Systems and System Models			Block Type:	<b>Text</b>
Block #	11	Title:	Prompts for Students	Style	
Content:				Paragraph	
STEM Teaching Tools developed <a href="#">Prompts for Integrating Crosscutting Concepts Into Assessment and Instruction</a> . Teachers can use these prompts in their classroom when asking students to identify systems and system models. This set of prompts is intended to help teachers elicit student understanding of crosscutting concepts in the context of investigating phenomena or solving problems.				Paragraph with subheading	x
These questions can be used by teachers to uncover student understanding of systems and system models or could be shared with students as sentence starters to support student dialog with each other. Here is a sample of questions can be used by teachers to uncover student understanding of systems and system models.				Heading	
Links:				Subheading	
<a href="http://stemteachingtools.org/assets/landscapes/STEM-Teaching-Tool-41-Cross-Cutting-Concepts-Prompts_Nov2016.pdf">http://stemteachingtools.org/assets/landscapes/STEM-Teaching-Tool-41-Cross-Cutting-Concepts-Prompts_Nov2016.pdf</a>				Two column	
				Table	
				Settings	
				Padding top	30px
				Padding bottom	30px
				Background color hex	FFFFFF
				Font size	
				Font color	

Lesson	Lesson 6: Systems and System Models			Block Type:	<b>List</b>
Block #	12	Title:		Style	
Content:				Numbered List	
How do the different components of the system interact? What would happen in this system if you increased [component of the system]?				Checkbox List	x
What would happen in this system if you decreased [component of the system]?				Bulleted List	
How do positive feedback loops in this system affect how it functions?				D	
How do negative feedback loops in this system affect how it functions?				Note	
				Settings	
				Padding top	30px
				Padding bottom	30px
				Background color hex	FFFFFF
				Font size	
				Font color	

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Lesson	Lesson 6: Systems and System Models	Block Type:	<b>Continue</b>
Block #	13	Settings	
Label:		Padding top	30px
Completion Type:	None (Always show button) <input checked="" type="checkbox"/>	Padding bottom	30px
	Complete block directly above	Background color hex	FFFFFF
	Complete all blocks above		
Hint text:			