Loyola University Chicago
Center for Science and Math Education

LEVERAGING THE LAST DIMENSION

Crosscutting Concepts Across Grade Levels

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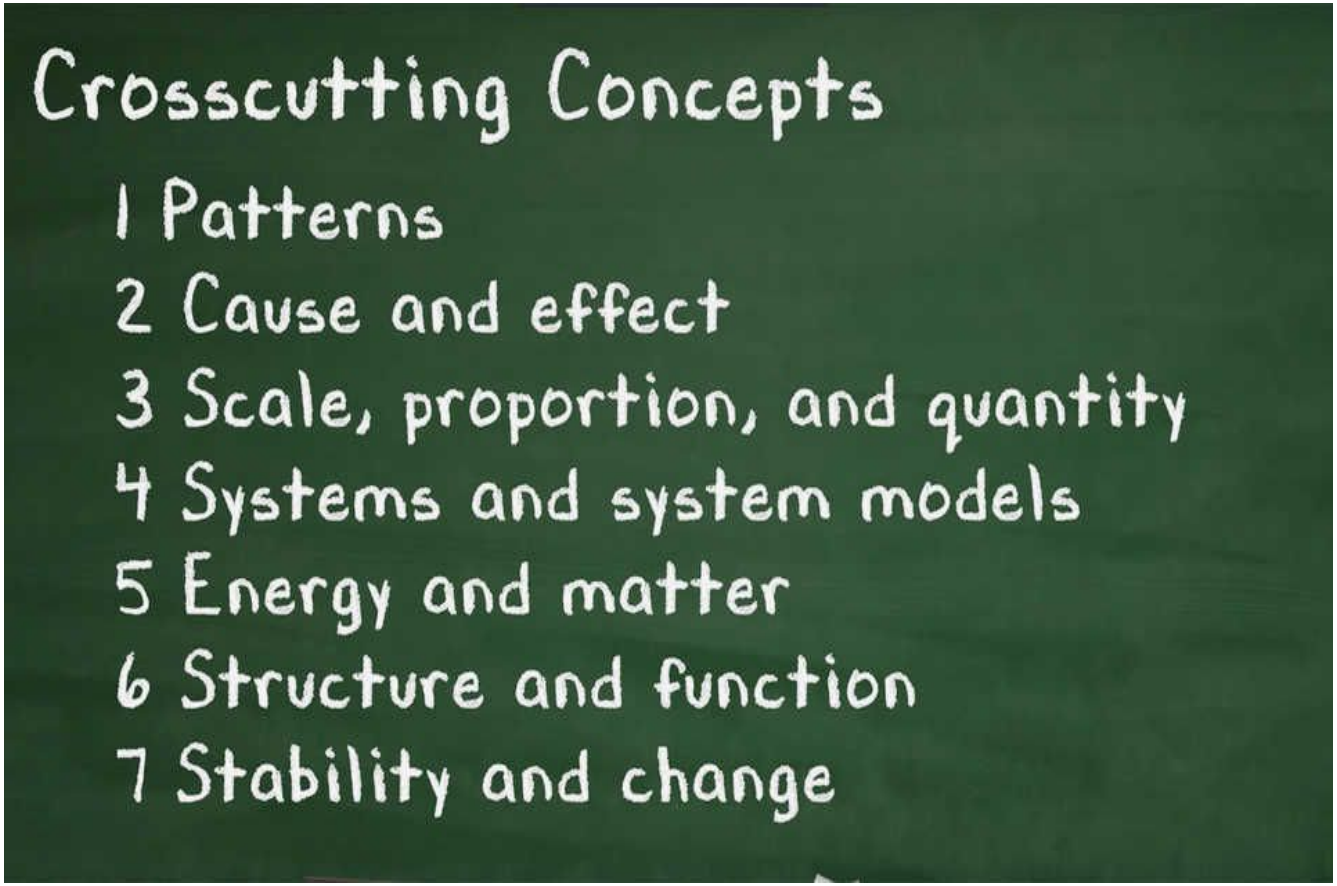
Meet Your Neighbor

Three Dimensions of NGSS

NGSS Cross-Cutting Concepts



Crosscutting Concept Exploration

Activity 1: CCC Progressions

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Cross-Cutting Concept Cards

Scale, proportion, and quantity

Scale, proportion, and quantity:

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
- The observed function of natural and designed systems may change with scale.
- Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.
- Scientific relationships can be represented through the use of algebraic expressions and equations.
- Phenomena that can be observed at one scale may not be observable at another scale.

from NGSS Appendix G: Crosscutting Concepts in the Next Generation Science Standards

Whole Group Discussion

- What are your initial observations about the progressions?
- Was it clear what order the ideas belonged in?
- What clues helped you figure out the progression?

Crosscutting Concept Exploration

Activity 2: One phenomenon, many CCCs

Piping Plovers

Using your CCC as your lens, record what you notice.

Source: https://www.youtube.com/watch?v=S5uUAALuVmc

System and System Models Example:

I notice 3 parts of the system interacting - one adult plover and 2 baby plovers.

Discussion

Can we connect this phenomenon to the CCC?

Can we find a connection for a specific grade band?

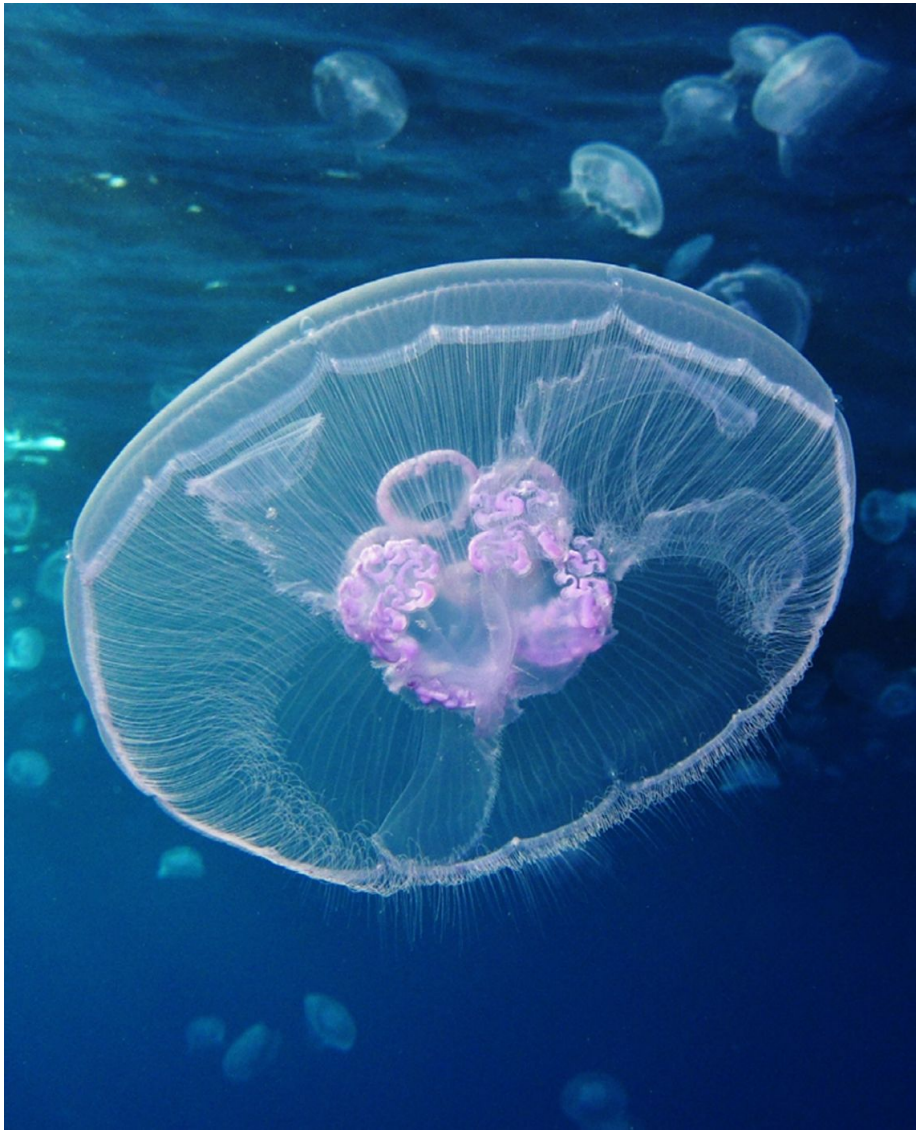
What might students ***learn*** from viewing this phenomenon through this CCC lens?

Does it help us understand something about the phenomenon?

CCC Reflections

LUC K-8 Vertical Collaboration Sessions

Puzzling Phenomenon



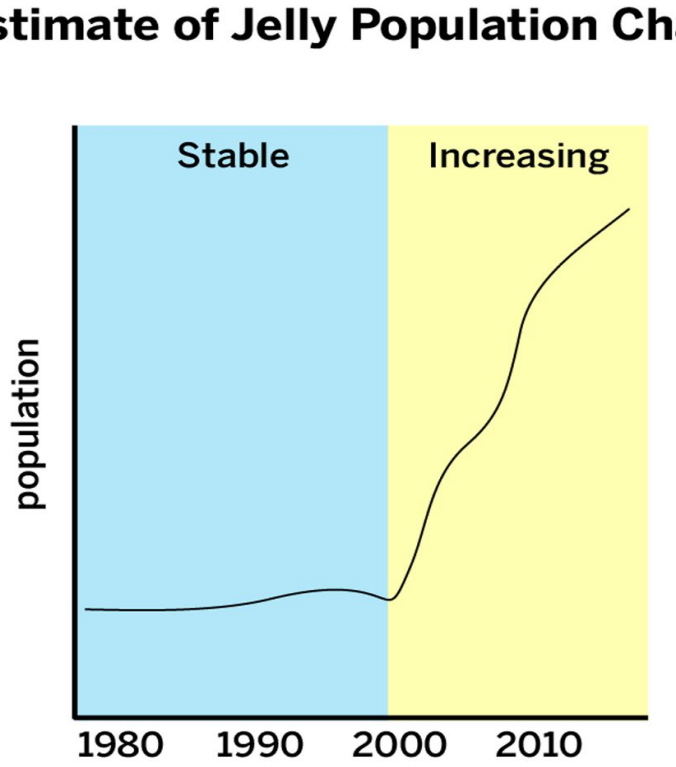
Why are the moon jelly populations changing?

Adapted from Amplify Science

Ecologists monitor moon jelly populations in Glacier Sea, AK

Adapted from Amplify Science

Population Change in Moon Jellies

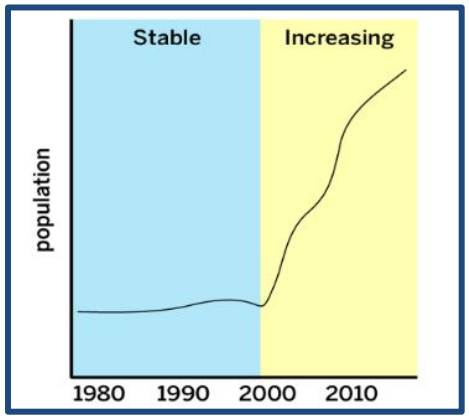


On the graph, we see that the jelly population was **stable** before the year 2000, and then it started **increasing.**

This change is what we will be modeling.

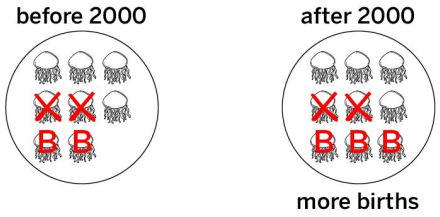
Adapted from Amplify Science

What could have caused the size of moon jelly populations to increase?



The population increased because . . .

Claim 1: Births increased.



Claim 2: Deaths decreased.

Modeling the possible ways moon jelly populations could have increased

Adapted from Amplify Science

Evidence-based connections

How did you connect with the crosscutting concept of Systems and System Models in this lesson?

It models a Life cycle.

Jellyfish need to be repeatedly sampled in identified locations to understand whether populations are increasing or decreasing over time.

Births are inputs of a system whereas deaths are outputs. Together they keep the system in balance.

System: Populations; modeled using a modeling tool

Once scientists know that there are changes in the population, they then study the other factors in the ecosystem to identify probable causes behind those changes.

Decrease in the number of deaths lead to an increase in the number of births.

Used a visual representation (i.e., token model) to understand stability and change in jelly populations.

If populations increase, the balance in the ecosystem is disturbed and there is a shortage of resources.

Randomly sampling the jellyfish allows scientists to estimate average population sizes in the ecosystem

Using the circles with births and deaths, we got to see why populations can increase and decrease.

Modeling the system studies of moonjellies in the Glacier Bay allowed scientists to understand the long term changes in their populations, and how they impacted other populations like fish, crab, shrimp, that also live in that ecosystem.

It is impossible to count all jellyfish in Glacier Sea. The population sizes are estimated based on repeated trawls of different parts of the sea.

Birth and deaths affect the population and they are connected.

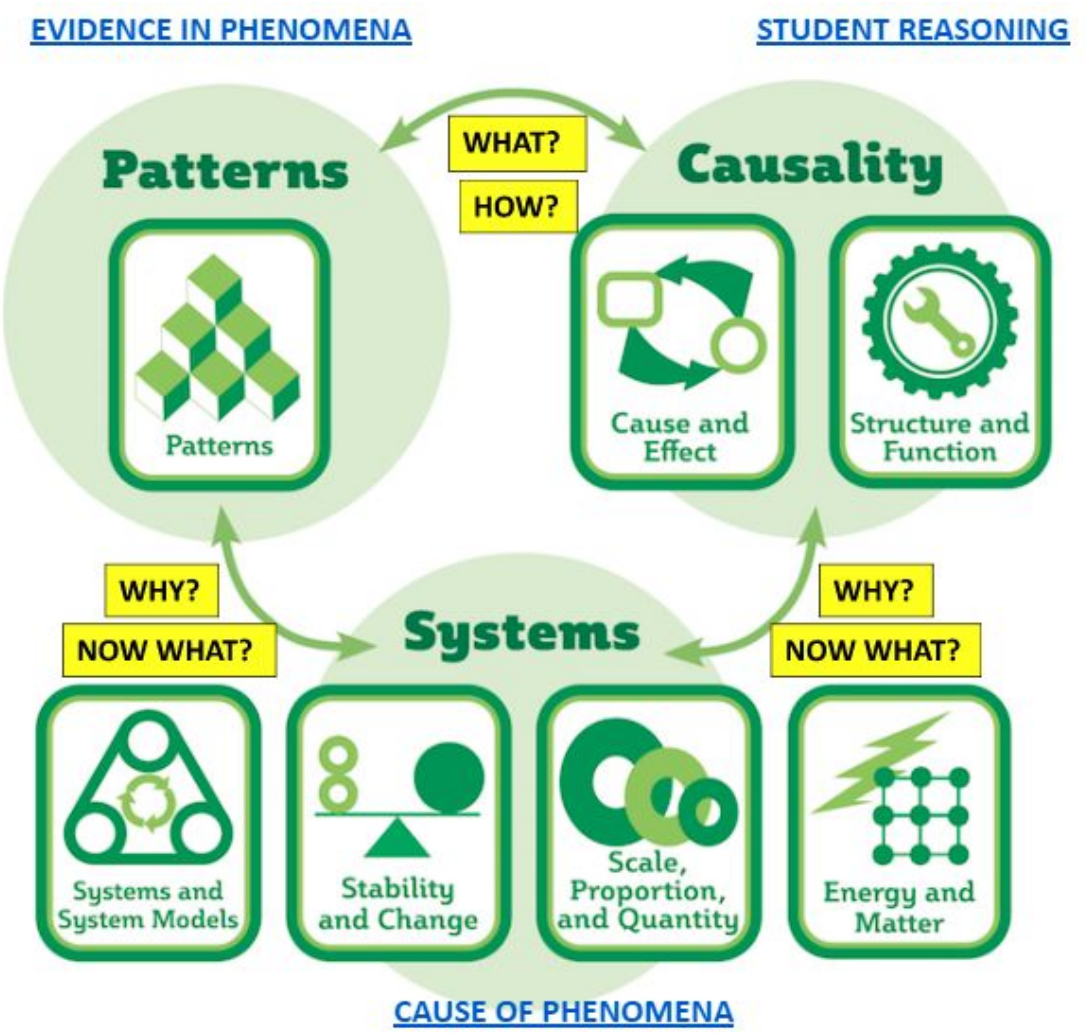
This method of modeling population change can be used to study other populations as well.

These models can be reliably used to study the balance in the ecosystem.

Your Connections

- Can you tie any of the Crosscutting Concept elements to a specific teacher comment?
- Is there a CCC connection you can make that is NOT on the Jamboard?
- Do teacher comments reflect engagement with other Crosscutting Concepts? What does that imply about the Crosscuts?
- If this phenomenon and/or content was not for 6-8, but for the grade band YOU teach, how might engagement with the crosscutting concept look different? Can you build on what this experience offers to make it applicable to your students?

Leveraging the Last Dimension



CER supports ???

Source: https://ngss.sdcoe.net/Evidence-Based-Practices/Using-the-Crosscutting-Concepts-to-Build-Student-Sense-Making-and-Reasoning

Q&A / Reflection

- How do ideas about what students might learn differ based on the CCC being applied?
- What is it like forcing yourself to examine a phenomenon through a specific lens? Did you notice or think about anything you might have missed otherwise?
- How might you go about deciding which CCC to use when teaching a given piece of content?
- How might using a CCC lens enhance student learning?

Consider…

Things to try:

- *Meet with your science team (grade level, vertical, etc.) and start a discussion around the CCC progressions.*
- *Choose a focal CCC for your science meetings next year.*
- *Be explicit with your instruction around the CCCs.*

Tools to use:

- *CCC Progressions*
- *Evidence-based thinking prompts*

THANK YOU!