Connecting Research to Practice: Connecting Science and Engineering Practices to Early Childhood Education

Presented by Omaha Public Schools Science Instructional Coaches

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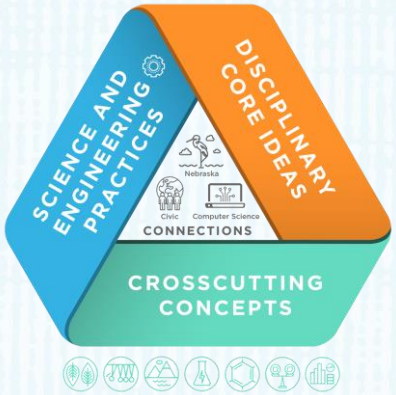
Learning Goals

- I can distinguish between Science and Engineering Practices
- I can investigate examples of Cross Cutting Concepts
- I can define Disciplinary Core Ideas
- I can identify Three Dimensional Learning

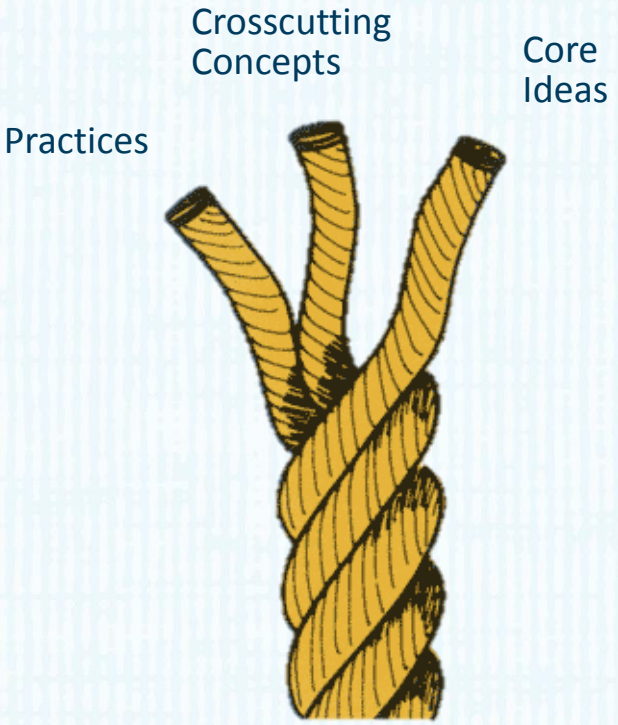
Terms



- SEPs – Science and Engineering Practices – What you do
- CCCs – Crosscutting Concepts – Connects all science domains and grade levels
- DCIs – Disciplinary Core Ideas – The science content being taught
- Three Dimensional Learning – Includes all of the items above every lesson

Content and Practice Work Together to Build Understanding: 3-Dimensional Learning

Nebraska College and Career Ready Science Standards call for students to become proficient in science and engineering:



Science & Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts work together to form usable knowledge by building the foundation for what students will be learning in K-12.

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Science & Engineering Practices

How do we engage kids?

Phenomena!

"Phenomena are observable occurrences. Students need to use the occurrence to help generate the science questions or design problems that drive learning." From Using Phenomena in NGSS-Designed Lessons and Units

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What do you notice about bubbles?

What do you wonder about bubbles?

What could children investigate with bubbles?

How big of a bubble can you blow?

How many bubbles can you blow with one breath?

If I change my bubble solution will I get more, bigger, or stronger bubbles?

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Questioning engages students in purposeful learning.

Let’s try it!

Soil samples

- Carefully pour your soil sample on to your paper plate.
- Use your popsicle sticks to explore your sample.
- Use your senses to generate a claim that explains where you think your sample originated.

Sample Identification:

- Write a claim based on your evidence that describes where this sample originated.
- **Start with: The sample came from _____ because_____**
- Write your claim using a **blue marker** on the paper provided.

What did you do?

- Now we are going to create a list of verbs that describe what you were doing while investigating the soil sample.

Let’s try something different!

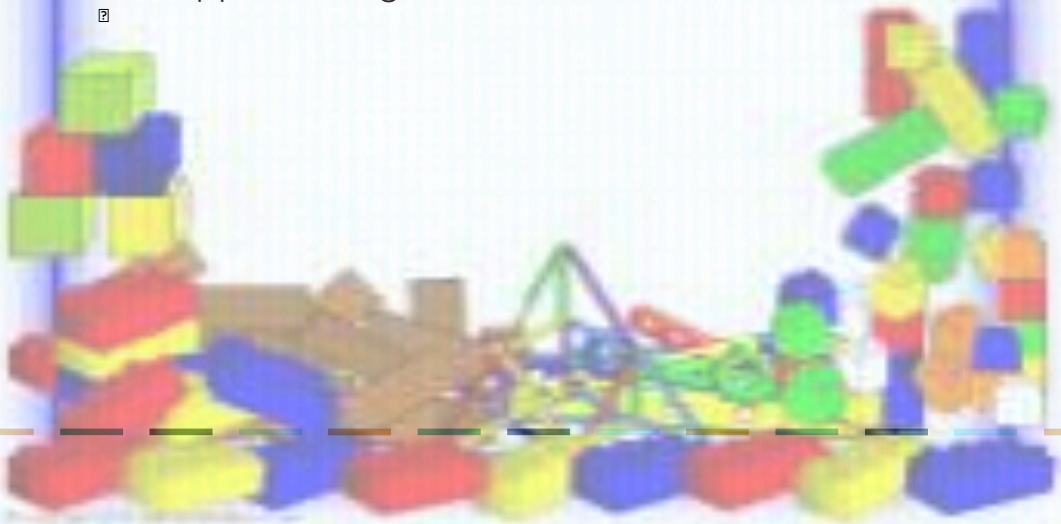
Challenge: Can you design and build a bridge that supports a can of food?

Materials needed:

- Lego bricks, Duplo bricks, or wooden blocks
- 1 can of food

Extra Challenges:

- Can your bridge hold two cans?
- Can your bridge hold a larger can?
- Who can make the tallest bridge that still supports a single can?



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Build a Bridge

Your Plan:

1. **Draw** your first design.
2. Build and test your design.
3. Based on what you noticed and wondered with your first design, draw your second design.
4. Build and test your second design.

Rules:

- Design and build a free-standing bridge that will support a can of food.
- You can only use what you are given:
  - Blocks (Lego, Duplo, wooden)
  - A can of food

When the can is placed on the bridge, it must hold the can without breaking.

Success:

- Holds the can for 30 seconds without breaking

What did you do?

- Now we are going to create a list of verbs that describe what you were doing while designing and building the bridge.

How were these two activities different?

Sample Observation

How do I explain this phenomenon?

Bridge Building

How I do I find a solution to a problem?

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How were these two activities different?

Sample Observation

- Characteristics of living and non-living
- Ecology
- Rock identification
- Life cycles
- Plant identification
- Structure and function
- Soil sample

How do I explain this phenomenon?

Bridge Building

- Asking questions
- Defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Obtaining, evaluating, and communicating information

How I do I find a solution to a problem?

	Sciences Practices	Engineering Practices
Investigating	Scientists ask questions, make observations and collect data.	Engineers define a problem's requirements and limits and collect data that informs possible solutions.
Evaluating	Scientists review and explore explanations and models. They talk about and test their claims based on their evidence and results. They offer other explanations.	Engineers review and propose solutions. They engage in discussions to evaluate solutions with the purpose of creating a design that effectively meets the problems requirements and limits.
Explaining and Solving	Scientists try to make sense of phenomena by using the evidence to create and change their explanations and models. They use results and evidence to think about new questions and hypotheses that can be tested.	Engineers identify possible solutions to a problem and develop models and prototypes that can be tested, analyzed and improved.

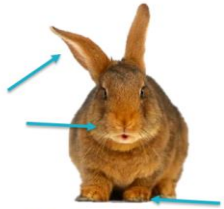
Crosscutting Concepts

Patterns

Cause and Effect

Systems & System Models

Scale, Proportion, & Quantity



Structure and Function

Energy and Matter

Stability and Change

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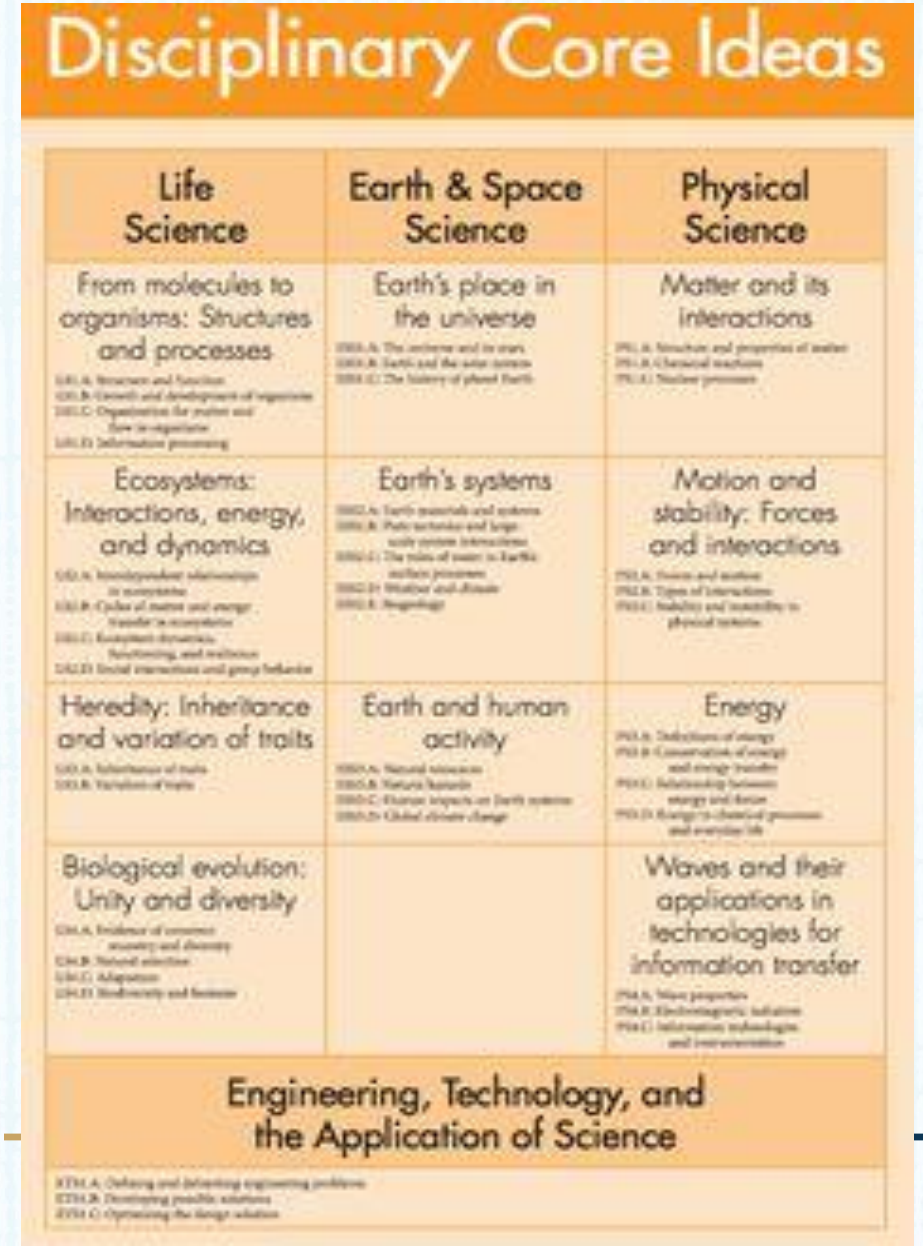
Crosscutting Concepts

- What crosscutting concepts did we use during the sample investigation?
- What crosscutting concepts did we use for the bridge building challenge?

Disciplinary Core Ideas

What is the science content behind what you are doing?



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Questions?

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