Engaging in Science and Engineering Practices

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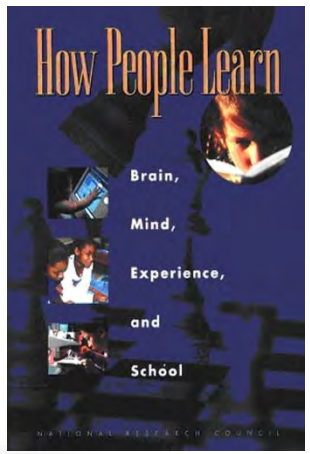
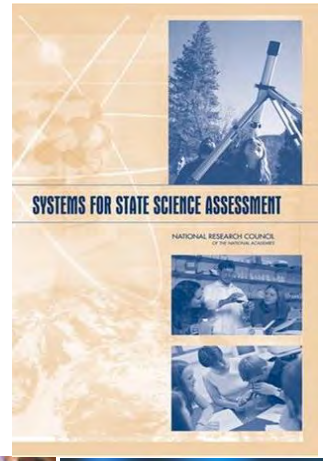
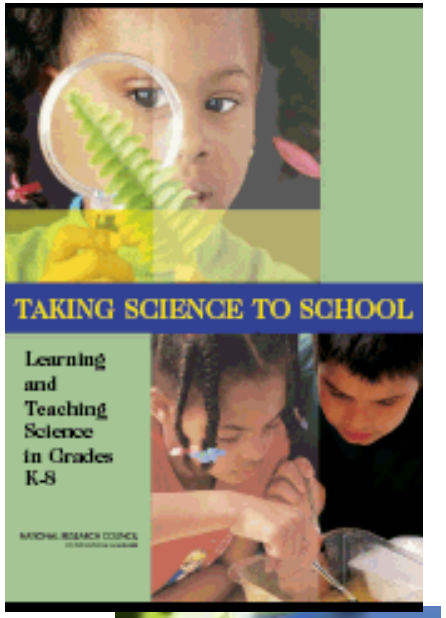
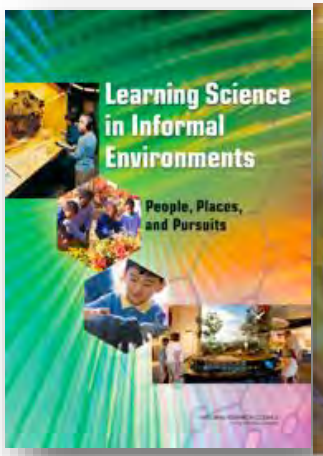
Ideas from research about science learning

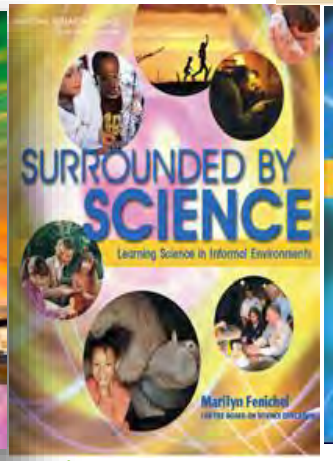
- Children are born investigators
- Understanding builds over time
- Science and Engineering require both knowledge and practice
- Connect to students' interests and experiences is essential
- Focus on core ideas and practices
- Promoting equity is essential

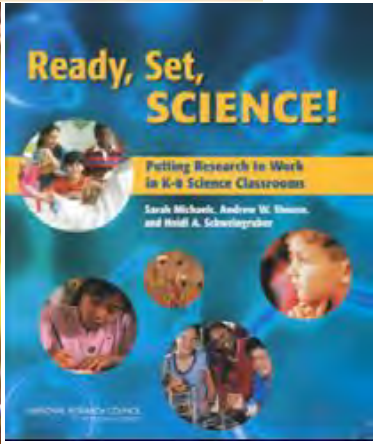




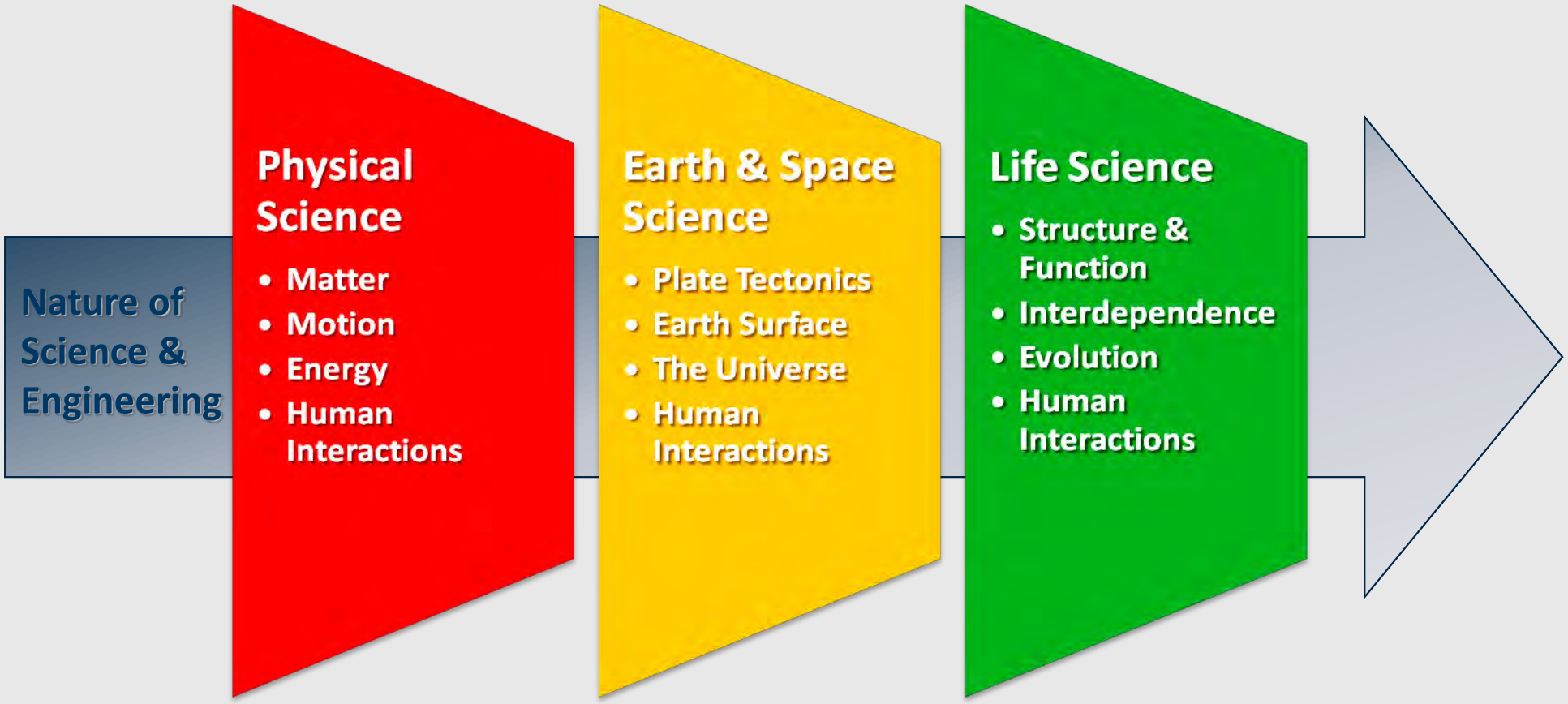








Minnesota Science Standards

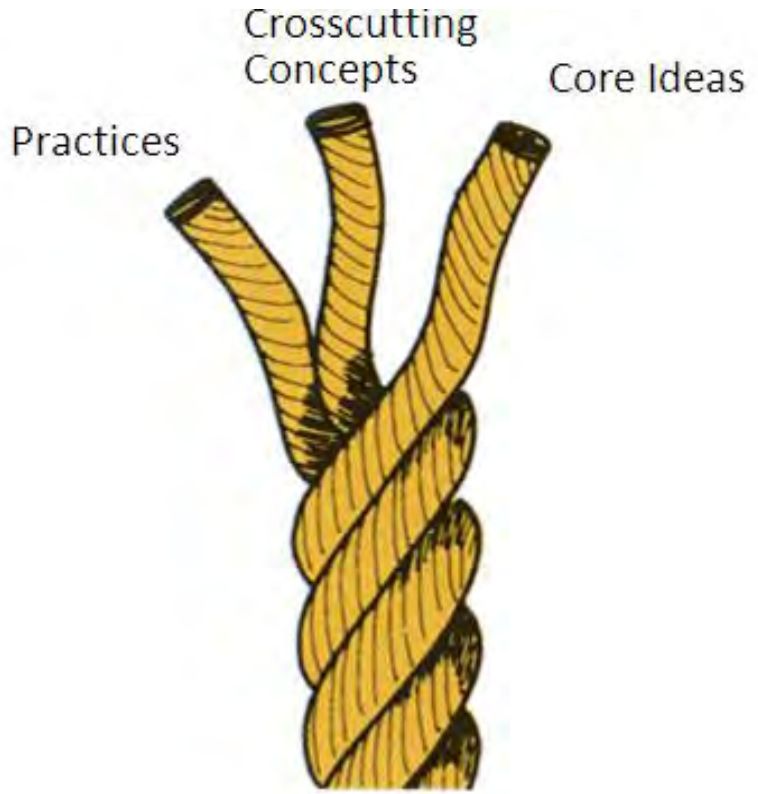


3 Dimensions of Science Learning

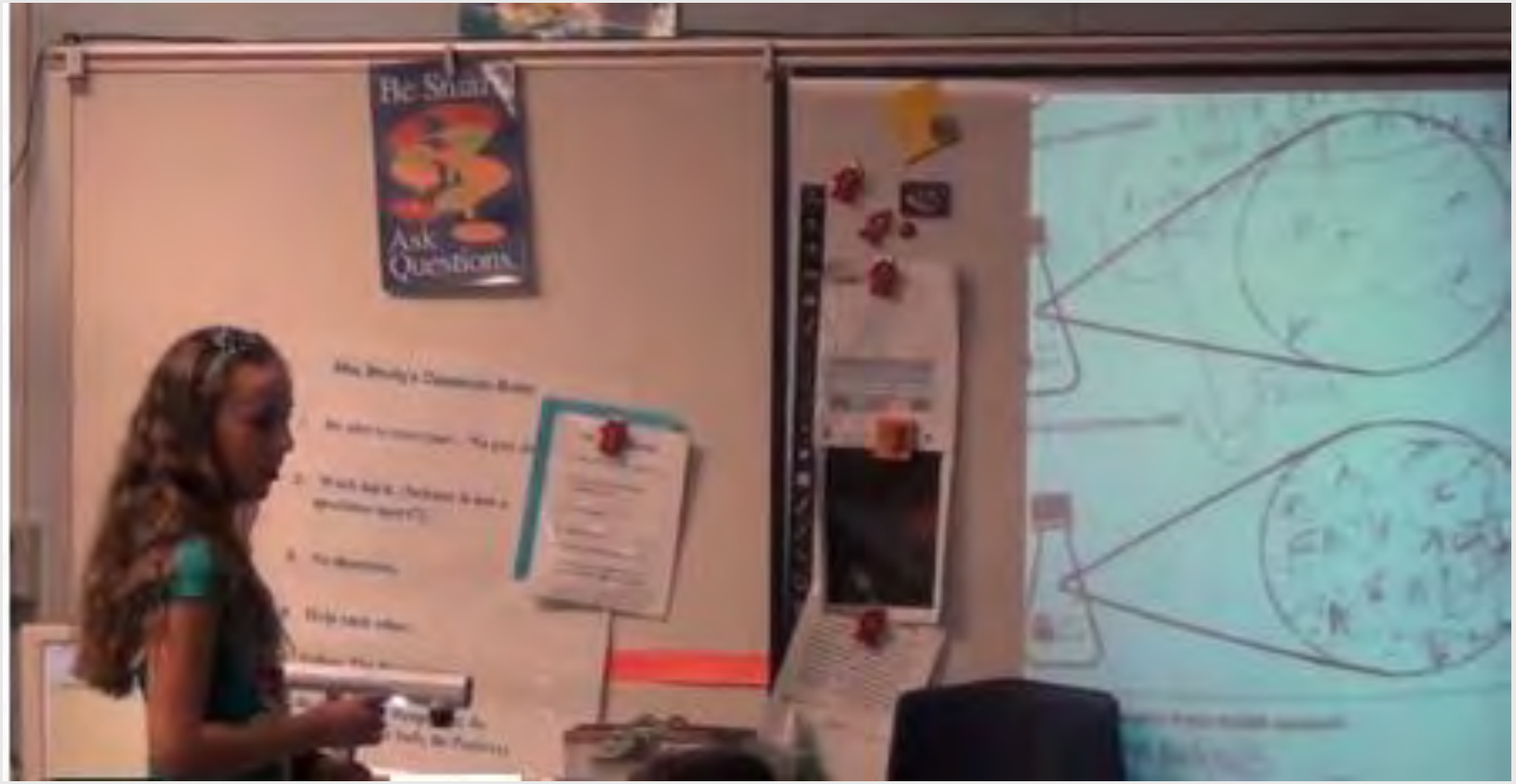
I. Scientific and Engineering Practices

II. Crosscutting Concepts

III. Core Ideas



Science and Engineering Practices



Why Practices

- **First** –Reduces tendency is to reduce scientific practices to a single set of skills.
- **Second** – Emphasizes there is not just a single “scientific method”.
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- **Third** –Inquiry has a lack of a common understanding.

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Science and Engineering Practices

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Developing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

What do these practices mean? How are they different from traditional instruction? How do the ideas progress from kindergarten through high school?

Carosel

1. Prepare a poster with
    - Features of the Practice
    - Progression of ideas
2. One sentence summary
3. How does your level look different from traditional instruction
4. Questions about the practice
5. Where do you find it in MN standards? (optional)

Progression

Grades K - 2	Grades 3 - 5	Middle School	High School
Make a claim and use evidence	Construct and support scientific arguments drawing on evidence, data, or a model. Consider other ideas.	Construct and present oral and written arguments supported by empirical evidence and reasoning to support or refute an explanation for a phenomenon.	Construct a counter-argument that is based in data and evidence that challenges another proposed argument.

What is the Role of Investigations in the Classroom?

Student – Planning and Carrying out Investigations

- Providing empirical evidence to support assertions
- Listening to others' arguments and analyze the evidence
- Evaluating arguments based on evidence and reasoning
- Developing own explanations based on evidence
- Communicating findings

Teacher – Engaging students in practices

- Making student thinking visible using argumentation, writing and models.
- Assessing student understanding to support student reasoning.
- Evaluating student explanations of Core Ideas.

Resources

- Doug.Paulson@state.mn.us, STEM Integration Specialist
  - @DPaulsonSTEM
- *Framework for K-12 Science Education*, www.nap.edu (free download) also *Ready, Set, Science*
- Mn Frameworks for Mathematics and Science www.scimathmn.org/stemtc
- Mn Science Teachers Assn. www.mnsta.org
- NGSS www.nextgenscience.org

DEPARTMENT OF EDUCATION

Thank you!