



# Activate the Framework & NGSS?



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#### What will we do today?

- Build similar understanding of the Framework and NGSS
  - Discuss the Framework and NGSS
- Allow time for questions, discussion and interaction

Learning goal for today: you can explain 3-dimensional learning to a colleague









### What population of students does the Framework and NGSS target?

#### **Science for All Students**

- Science, engineering and technology
- are not a luxury
- serve as cultural achievements and a shared good of humankind
- permeate modern life and as such is essential at the individual level
- critical to participation in public policy and good decision-making
- essential for ensuring that future generations will live in a society that is economically viable, sustainable and free



#### What's new in the Framework and NGSS?





- Focus on explaining phenomena or designing solutions to problems
- 2. 3-Dimensional Learning
  - 1. Organized around disciplinary core explanatory ideas
  - 2. Central role of scientific and engineering practices
  - 3. Use of crosscutting concepts
- 3. Instructions builds towards performance expectations
- 4. Coherence: building and applying ideas across time



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#### What is three 3-Dimensional Learning Learning

 Three-dimensional learning shifts the focus of the science classroom to environments where students use disciplinary core ideas, crosscutting concepts with scientific practices to explore, examine, and explain how and why phenomena occur and to design solutions to problems









#### Why Core Ideas??

- Scientists and experts structure knowledge around conceptual frameworks
  - guide how they solve problems, make observations, and organize and structure new information
- Core ideas provide the anchor to create frameworks for integrating related concepts and principles for meaningful understanding





### What's so special about disciplinary core ideas?

- Fewer, clearer, greater depth
- Allow learners to develop understanding that can be used to solve problems and explain phenomena.
- Serve as thinking tools
  - Not what is but provide reasons for phenomena
- Allow individuals to explain a variety of phenomena





### How are DCIs Different than Science Concepts?

1. The Framework and NGSS move teaching away from a focus on presenting numerous disconnected facts to a focus on a smaller number of disciplinary core ideas which learners can use to explain phenomena and solve problems









#### Why Use Crosscutting Concepts?

Ideas that cut across and are important to all the science disciplines

Provide different lenses to examine phenomena

- 1. Patterns
- 2. Cause and effect
- Scale, proportion and quantity
- 4. Systems and system models
- 5. Energy and matter
- 6. Structure and function
- 7 Stability and change





#### What are Scientific and Engineering Practices?

The multiple ways of knowing and doing that scientists and engineers use to study the natural world and design world.

The practices work together – they are not separated!

- Asking questions and defining problems
- Developing and using models
- 3. Planning and carrying out investigations
- 4. Analyzing and interpreting data

- 5. Using mathematics and*computational thinking* 
  - . Developing explanations and designing solutions
- 7. Engaging in argument fromevidence
- 8. Obtaining, evaluating, and communicating information





#### What's the value of scientific practices?

- Practices shift the focus from science classrooms as an environment where students *learn about* science ideas to places where students *explore, examine and use* science ideas to explain how and why phenomena occur.
- Science instruction should focus on figuring out how phenomena work!







#### Content (scientific ideas) is not enough!

- Understanding content is inextricably linked to engaging in practices. Simply "consuming" information leads to declarative, isolated pieces of information.
- Research on how students learn shows that students can't learn disciplinary content without engaging in disciplinary practices, and they can't learn these practices without learning the content
- To form useable understanding, knowing and doing cannot be separated, but rather must be learned together
- Allows for problem-solving, decision making, explaining realworld phenomena, and integrating new ideas.





#### DCI, CCCs and Practice Work together to Build Understanding

- Scientific ideas are best learned when students engage in practices
- Practices are learned best when students use them to engage with learning specific scientific ideas
- Content and practices codevelop – 3-dimensional learning



#### An Analogy between 3-Dimensional Learning and Cooking









Kitchen Tools & Techniques (Practices)

Herbs, Spices, & Seasonings (Crosscutting Concepts)



Preparing a Meal (Three dimensional Learning)



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#### What is three 3-Dimensional Learning Learning

 Three-dimensional learning shifts the focus of the science classroom to environments where students use core ideas, crosscutting concepts with scientific practices to explore, examine, and explain phenomena occur or design solutions to problems









### What should we look for in designing or deciding on materials?

The lesson/unit aligns with the conceptual shifts of the NGSS:

 Elements of the science and engineering practice(s), disciplinary core idea(s), and crosscutting concept(s), blend and work together to support students in three-dimensional learning to make sense of phenomena or design solutions.

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#### NGSS is Different

- Standards expressed as performance expectations
- Combine practices, core ideas, and crosscutting concepts into a single statement of *what is to be assessed at the end of grade for K* 5 and grade band for 6 8
  *and* 9 12.



• They are not instructional strategies or objectives for a lesson.





#### **Describe Achievement, Not Instruction**

- Standards articulate a clear vision of the learning goals for students
- Standards articulate the student performance at the conclusion of instruction
- Standards are NOT a description of curriculum.
  Standards do NOT dictate instruction.

## How do we move further? How do I support students in reaching a PE?







- Business is not the same!
- NGSS is different!



 Revolution and not evolution





#### A concluding message

 By focusing on core ideas blended with practices and crosscutting concepts, classrooms become learning environments where teachers and students have time to engage in science by designing and carrying-out investigations and making and debating claims supported by evidence and reasoning.

### Activate Learning



Middle school curriculum materials supporting students using science practices to construct and apply disciplinary core ideas

IQWST: Investigating and Questioning our World through Science and Technology (Krajcik, Reiser, Sutherland, & Fortus, 2013)