
# PDI-7: Developing Assessments of NGSS Performance Expectations

## NSTA Professional Development Institute

## Wednesday, April 2, 2014

# Introductions

# Agenda

| Time | Activities |
|---|---|
| 9:00 - 9:30 | Overview of the Day and Introductions |
| 9:30 - 10:20 | Task Analysis |
| 10:20 - 10:35 | BREAK |
| 10:35 - 10:45 | From Performance Expectations to Assessments: An Overview |
| 10:45 - 11:45 | Unpacking Science Practices: Explanation and Modeling |
| 11:45 - 12:45 | LUNCH |

# Agenda

| Time | Activities |
|---|---|
| 12:45 - 1:50 | Applying Evidence-Centered Design to Develop a NGSS Assessment Argument |
| 1:50 - 2:15 | Designing  Assessment Items and Rubrics |
| 2:15 - 2:30 | BREAK |
| 2:30 - 3:00 | Sharing Assessment Items and Rubrics |
| 3:00 - 3:45 | Assessment in Action and Developing a Formative Assessment Toolkit |
| 3:45 - 4:00 | Summary and Future Directions |

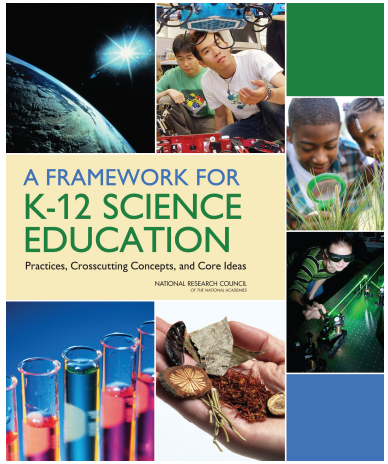
# The Vision Behind NGSS

- Science, engineering and technology are cultural achievements and a shared good of humankind.
- Science, engineering and technology permeate modern life and as such are essential for all individuals.
- National need to improve science education.
- Understanding of science and engineering is critical to participation in public policy and good decision-making.

# The NRC Framework and NGSS

## What is new?

1. Organized around core disciplinary ideas
2. Central role of science practices
3. Coherence: building and applying ideas across disciplines
4. Standards expressed as performance expectations




NEXT GENERATION SCIENCE STANDARDS
For States, By States

# Concepts vs. Disciplinary Core Ideas

- Examples of Concepts
  - All forces arise out of an interaction between two objects and these forces are equal in magnitude and opposite in direction.
  - During physical changes, the particles stay the same in size, shape, mass and composition.

- Example of Disciplinary Core Idea
  - Matter and Its Interactions: How can one explain the structure, properties and interactions of matter?
    - How do particles combine to form the variety of matter one observes?
    - How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?

# Disciplinary Core Ideas

- Disciplinary significance
  - Broad importance within and across disciplines
- Explanatory power
  - Can be used to explain a host of phenomena
- Generative
  - Tool for developing integrated understandings and investigating complex problems
- Relevant to people's lives
  - Connects to interests and life experiences of students, societal and personal concerns
- Usable from K to 12
  - Is teachable and learnable over multiple grades at increasing levels of depth and sophistication

# Science Practices

*Ways of knowing and understanding our world*

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

# Science Practices

*Some new practices to shape instruction and assessment*

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

# Science Practices

*Iterative, Connected, and Interactive*

- Ask a question
- Develop initial model to predict what will happen and why it will happen
- Plan and carry out an investigation to test model
- Analyze and interpret data
- Use evidence to explain
- Revise own model and compare with classmates' models
- Engage in argument using evidence
- Revise own model

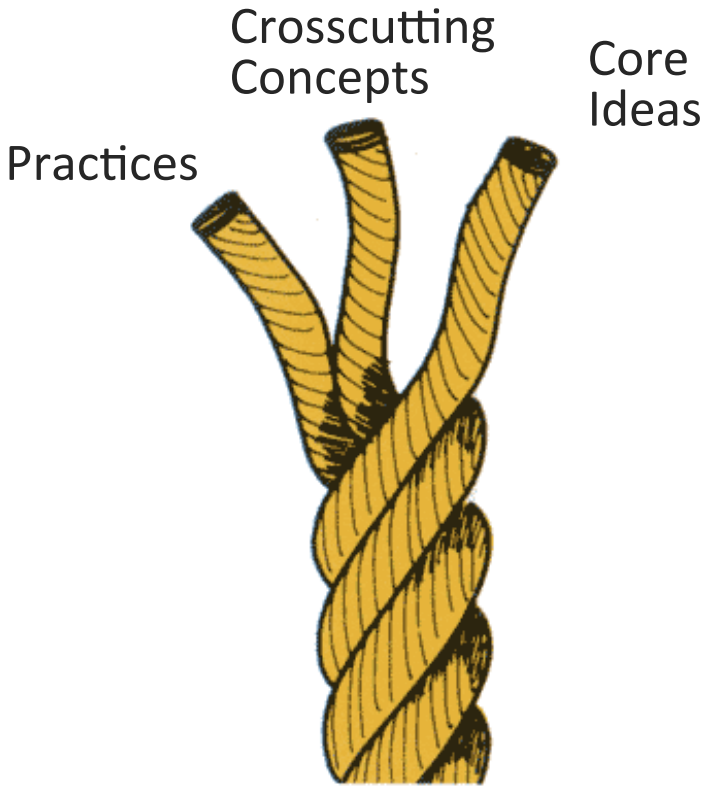
# Crosscutting Concepts

*Important to all science disciplines*

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

# Implications for Curriculum, Instruction, and Assessment

- Demands integration of 3 dimensions
- Need to pay attention to how we build understanding across the disciplines
- Need to involve learners in using scientific practices to develop and apply the scientific ideas

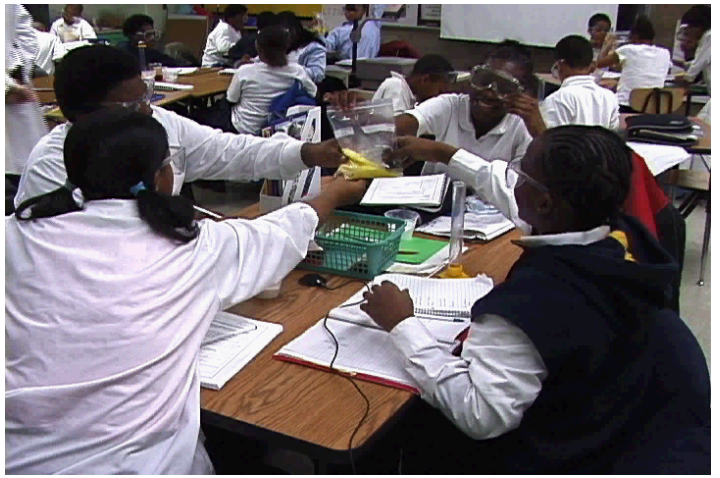


# NGSS Performance Expectations

Standards are referred to as performance expectations

Each performance expectation:

- Integrates the 3 dimensions
- Requires students to demonstrate **knowledge-in-use**



# Composition of Performance Expectations

**Practice:** Construct a scientific explanation based on evidence

**Core idea LS4.C:** Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.

**Crosscutting Concept:** Cause and Effect

**Performance expectation**: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

# Composition of Performance Expectations

**Practice:** Develop and Use a Model

**Core idea PS1.B:** Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. The total number of each type of atom is conserved, and thus the mass does not change.

**Crosscutting Concept:** Energy and Matter

**Performance expectation**: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

# Assessment Challenges

- How can we assess “three-dimensional learning”?
- How is it different from how we assess science learning now?
- What are some of the decisions we will need to make when designing assessments?

# How good are these tasks?

Each of the five tasks in front of you addresses a single performance expectation in Earth science.

Work with a small group to:

- Rate how well you think each task will elicit useful evidence for whether a student has met that performance expectation.
- Justify your ratings for each task, based on your reading of the performance expectations.
- If time, rank order the tasks from "best" to "worst" in terms of the strength of evidence they will elicit with respect to student mastery.

Record your responses here:
**http://tinyurl.com/o4zds7u**

# Compare your responses

You can see how your group's responses compare to others here:

http://tinyurl.com/p22vclv