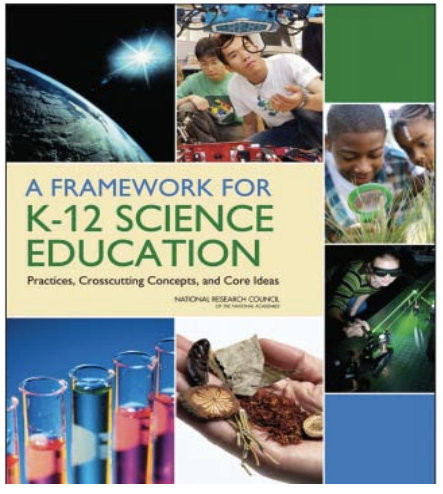

# Next Generation Science Standards

# Building on the Past; Preparing for the Future


1990s

Phase I

Phase II




1/2010 - 7/2011

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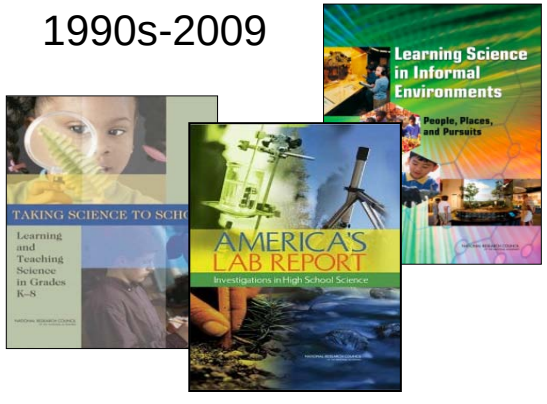
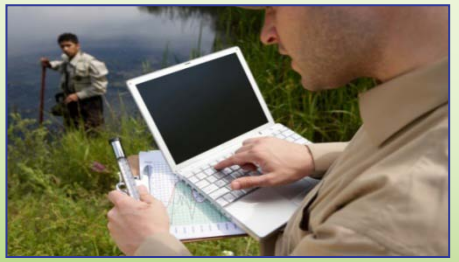
7/2011 – April 2013

1990s-2009



# January Feedback



- Concerns that there was still too much material
- Suggestions for a few additional topics to include
- Increase language clarity
- Concerns about including and addressing engineering and technology
- Concern about the amount of support that will be needed for implementation of the standards.

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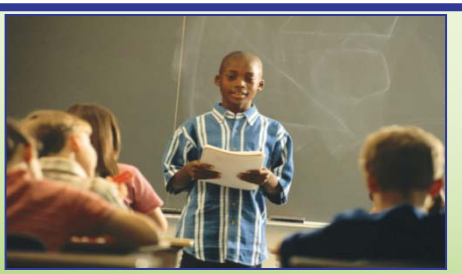
# Response to Feedback



- A review of the central focus of each disciplinary core idea (DCI) from the *Framework* resulted in the removal of about 33% of the performance expectations and associated DCIs, while retaining the progression of DCIs across the grade bands.
- Engineering Design Standards in each grade band.
- "Storylines" with guiding questions were added to the beginning of each grade band and section to describe the context and rationale for the performance expectations.
- The "All Standards, All Students" appendix was expanded to include several vignettes about implementation of the NGSS with diverse student groups.


# What's Different about the Next Generation Science Standards?

# Conceptual Shifts in the NGSS

1. K-12 Science Education Should Reflect the Interconnected Nature of Science as it is Practiced and Experienced in the Real World.
2. The Next Generation Science Standards are student performance expectations – NOT curriculum.
3. The science concepts build coherently from K-12.
4. The NGSS Focus on Deeper Understanding of Content as well as Application of Content.
5. Science and Engineering are Integrated in the NGSS from K–12.
6. The NGSS are designed to prepare students for college, career, and citizenship.
7. The NGSS and Common Core State Standards ( English Language Arts and Mathematics) are **Aligned.**

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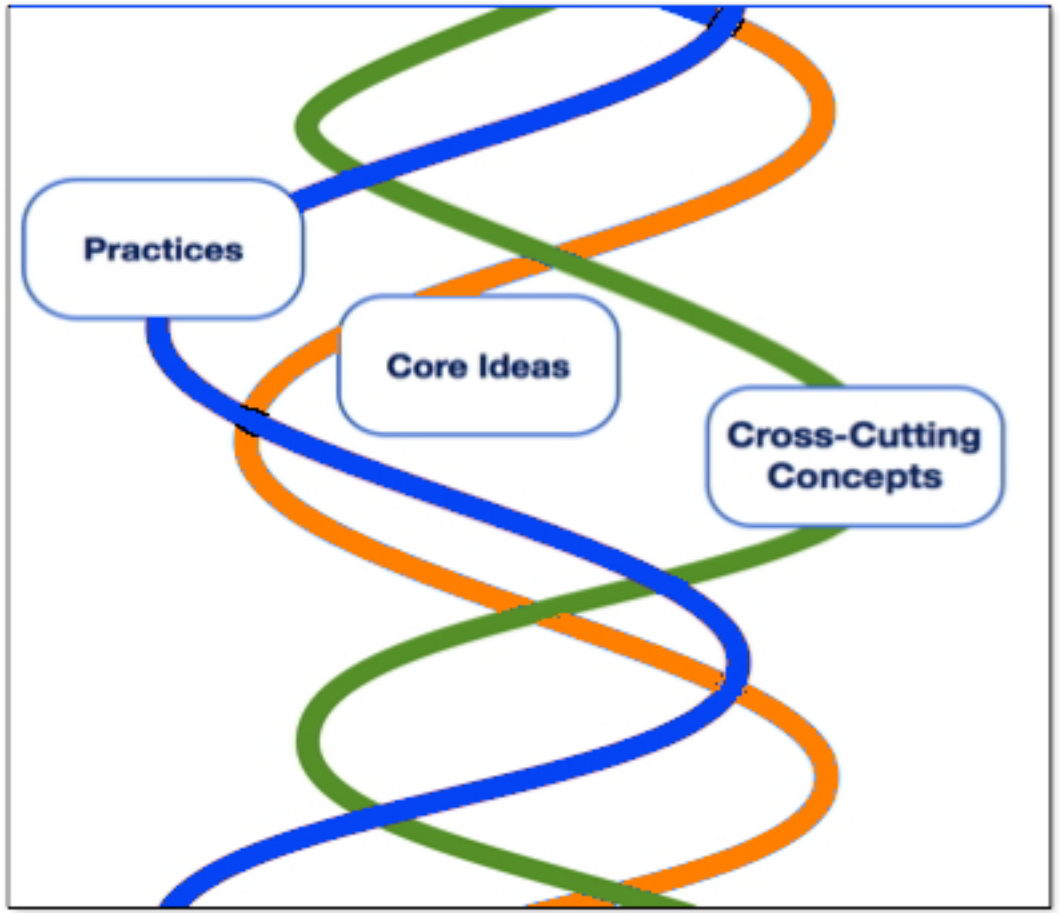
# Three Dimensions Intertwined




- The NGSS are written as Performance Expectations
- NGSS will require contextual application of the three dimensions by students.
- Focus is on how and why as well as what

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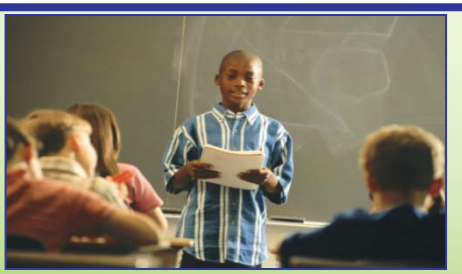
# Weaving Practices with Content – Not Just the NGSS



- K-12 Science Education Framework
- New Advanced Placement Coursework and Assessment
- PISA 2015
- Vision and Change in Undergraduate Biology
- A New Biology for the 21st Century
- Scientific Foundations for Future Physicians

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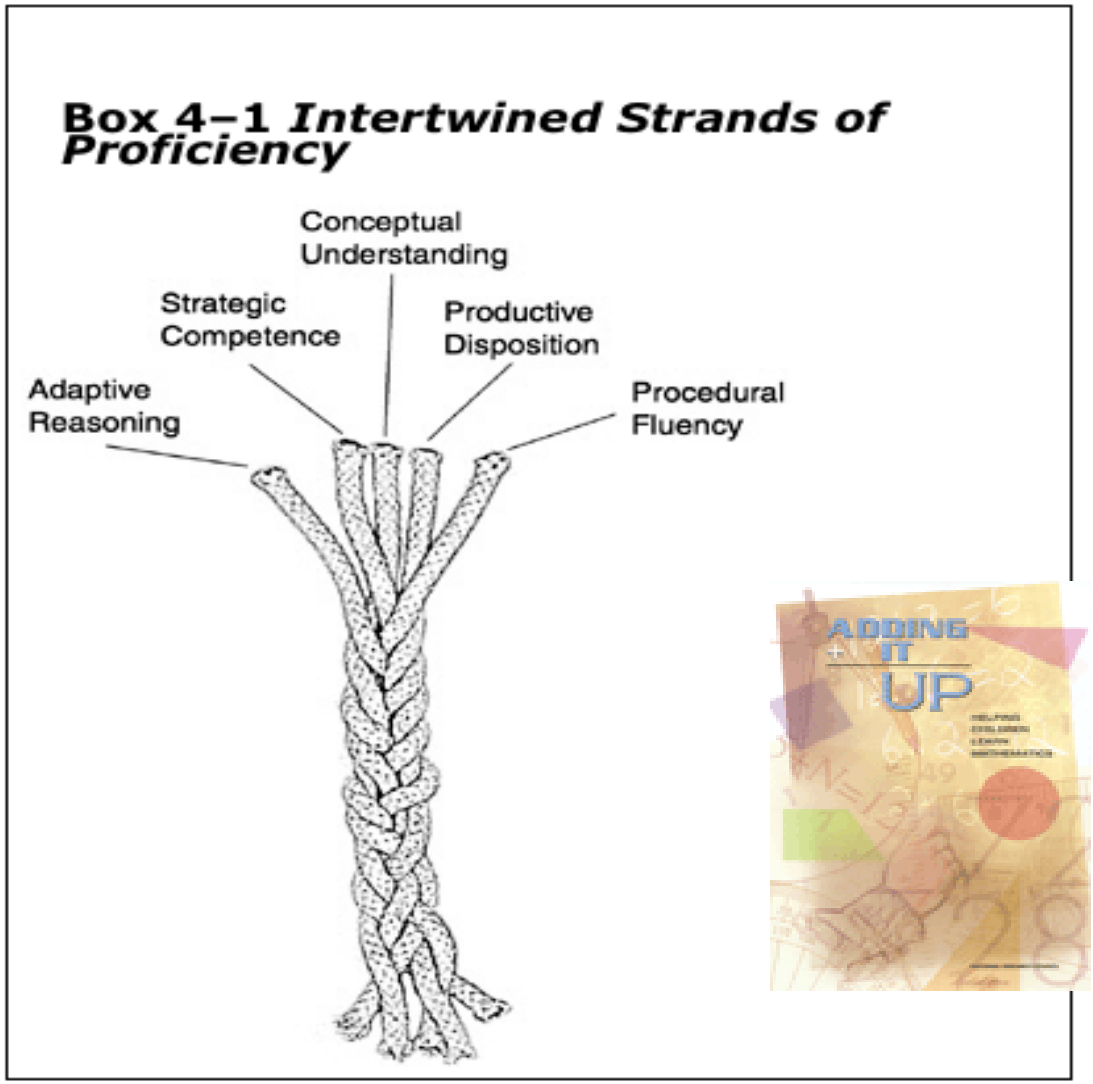
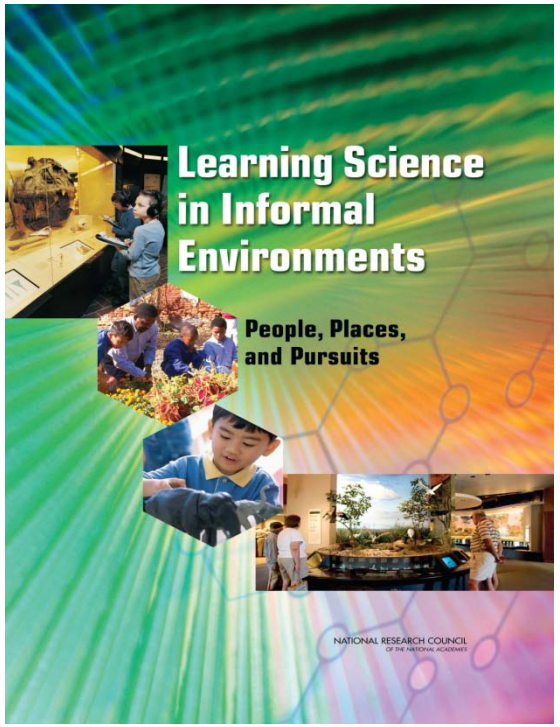
# How do we know this approach works?

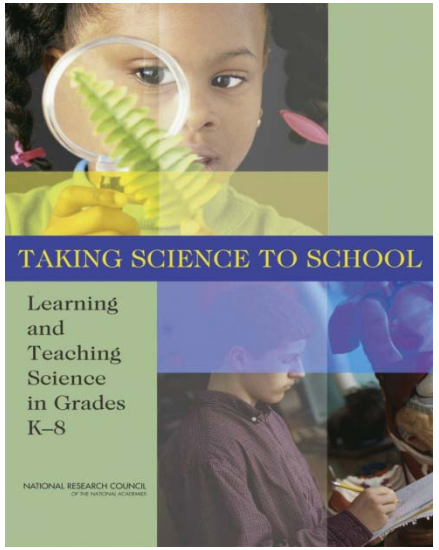








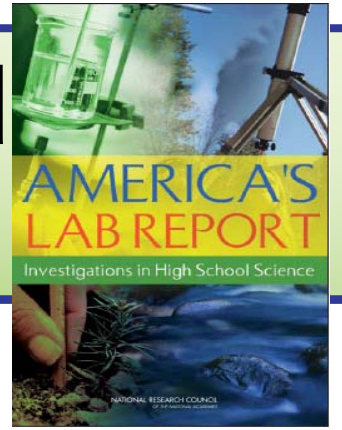

6 strands – incorporates affective domain




4 strands

**Motivation and Engagement**

# Goals of Laboratory Experiences based on ALR Findings




- Mastery of subject matter.
- Developing scientific reasoning.
- Understanding the complexity and ambiguity of empirical work.
- Developing practical skills.
- Interest in science and science learning.

Currently, research indicates significant numbers of students do not have quality opportunities to engage in science and engineering practices

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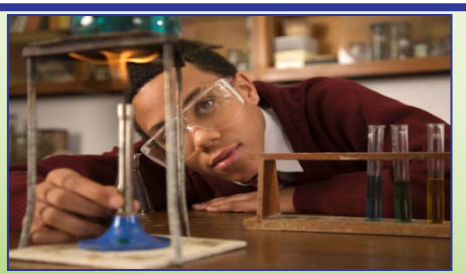
# Findings from ALR



## Typical Lab Practice

- Content Mastery
  - No better or worse than other modes of instruction.
- Scientific Reasoning
  - Aids development of *some* aspects
- Interest in Science
  - *Some* evidence of increased interest.

## Integrated Dimensions

- Content Mastery
  - Increased mastery of subject matter compared to other modes of instruction.
- Scientific Reasoning
  - Aids development of *more sophisticated* aspects
- Interest in Science
  - *Strong* evidence of increased interest.

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# Science and Engineering Practices, Not just teaching strategies

- Science and Engineering Practices are how scientific knowledge is acquired
- While Practices should be used in instruction, all students need to demonstrate achievement in their use and application

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# 1-LS1 From Molecules to Organisms: Structures and Processes

## 1-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

**1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*** [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

**1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

**Constructing Explanations and Designing Solutions**
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)

**Obtaining, Evaluating, and Communicating Information**
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

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***Connections to Nature of Science***

**Scientific Knowledge is Based on Empirical Evidence**

- Scientists look for patterns and order when making observations about the world. (1-LS1-2)

### Disciplinary Core Ideas

**LS1.A: Structure and Function**

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

**LS1.B: Growth and Development of Organisms**

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2)

**LS1.D: Information Processing**

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)

### Crosscutting Concepts

**Patterns**

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2)

**Structure and Function**

- The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)

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***Connections to Engineering, Technology, and Applications of Science***

**Influence of Engineering, Technology, and Science on Society and the Natural World**

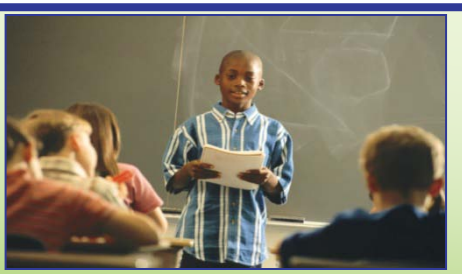
- Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. (1-LS1-1)

*Connections to other DCIs in this grade-level: will be available on or before April 26, 2013.*

*Articulation of DCIs across grade-levels: will be available on or before April 26, 2013.*

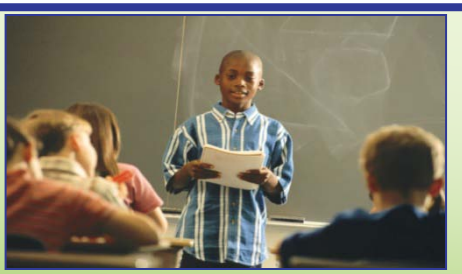
*Common Core State Standards Connections: will be available on or before April 26, 2013.*
*ELA/Literacy* –
*Mathematics* –

# Supporting Materials



- Appendices have been added to support the NGSS and in response to feedback
  - Appendix A – Conceptual Shifts
  - Appendix B – Responses to Public Feedback
  - Appendix C – College and Career Readiness
  - Appendix D – All Standards, All Students
  - Appendix E – Disciplinary Core Idea Progressions in the NGSS
  - Appendix F – Science and Engineering Practices in the NGSS
  - Appendix G – Crosscutting Concepts in the NGSS
  - Appendix H – Nature of Science
  - Appendix I – Engineering Design in the NGSS
  - Appendix J – Science, Technology, Society, and the Environment
  - Appendix K – Model Course Mapping in Middle and High School
  - Appendix L – Connections to Common Core State Standards in Mathematics
  - Appendix M – Connections to Common Core State Standards in ELA

# Seriously…



Thank You

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