Framework for K-12 Science &
Next Generation Science Standards:
An Overview

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Slides from Helen Quinn
(Stanford U. and NRC/NAS)
Background: K-12 Standards

+ US K-12 education: State and local control

+ “Common Core” Math and Language Arts: 47+ states
Foundation for Standards
(from US National Academy of Sciences)

A FRAMEWORK FOR
K-12 SCIENCE EDUCATION
Practices, Crosscutting Concepts, and Core Ideas
2012

NRC Board on
Science Education
U.S National Science Standards (Pre-college) Under Development

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Framework

Standards

Assessments

Curricula

Instruction

Achieve, Inc. Coordinator

Teacher Preparation and development

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Three Dimensions of Modern Science Education

+ Disciplinary core ideas
+ Crosscutting concepts
+ Scientific and engineering practices
Disciplinary Core Ideas: Physical Sciences

- PS1 Matter and its interactions
- PS2 Motion and stability: Forces and interactions
- PS3 Energy
- PS4 Waves and their applications in technologies for information transfer

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AP Science Reform

+ Reduce Coverage (Emphasize core ideas)
+ Teach students to think like scientists (Inquiry)
Crosscutting Concepts

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

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Scientific 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

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Integrating Practices

NRC Framework for K-12 Science Education
A Framework for Undergraduate Science Education?
Why don’t GT Intro. Physics labs look like this?
Example: Mechanics (Motion Prediction)

PS2.A: Forces and Motion

+ Cognitive Principles (Reif)

+ Modeling Instruction (Hestenes)

+ Computational Thinking
  (Chabay & Sherwood)
References

* Framework: K-12 Science Standards:
  http://www.nap.edu/catalog.php?record_id=13165

* Webinar by Helen Quinn on framework
  http://www.aps.org/careers/guidance/webinars/nextgen.cfm

* K-12 Standards Development
  http://www.nextgenscience.org/