Conceptual Framework for Science Education and the Next Generation Science Standards

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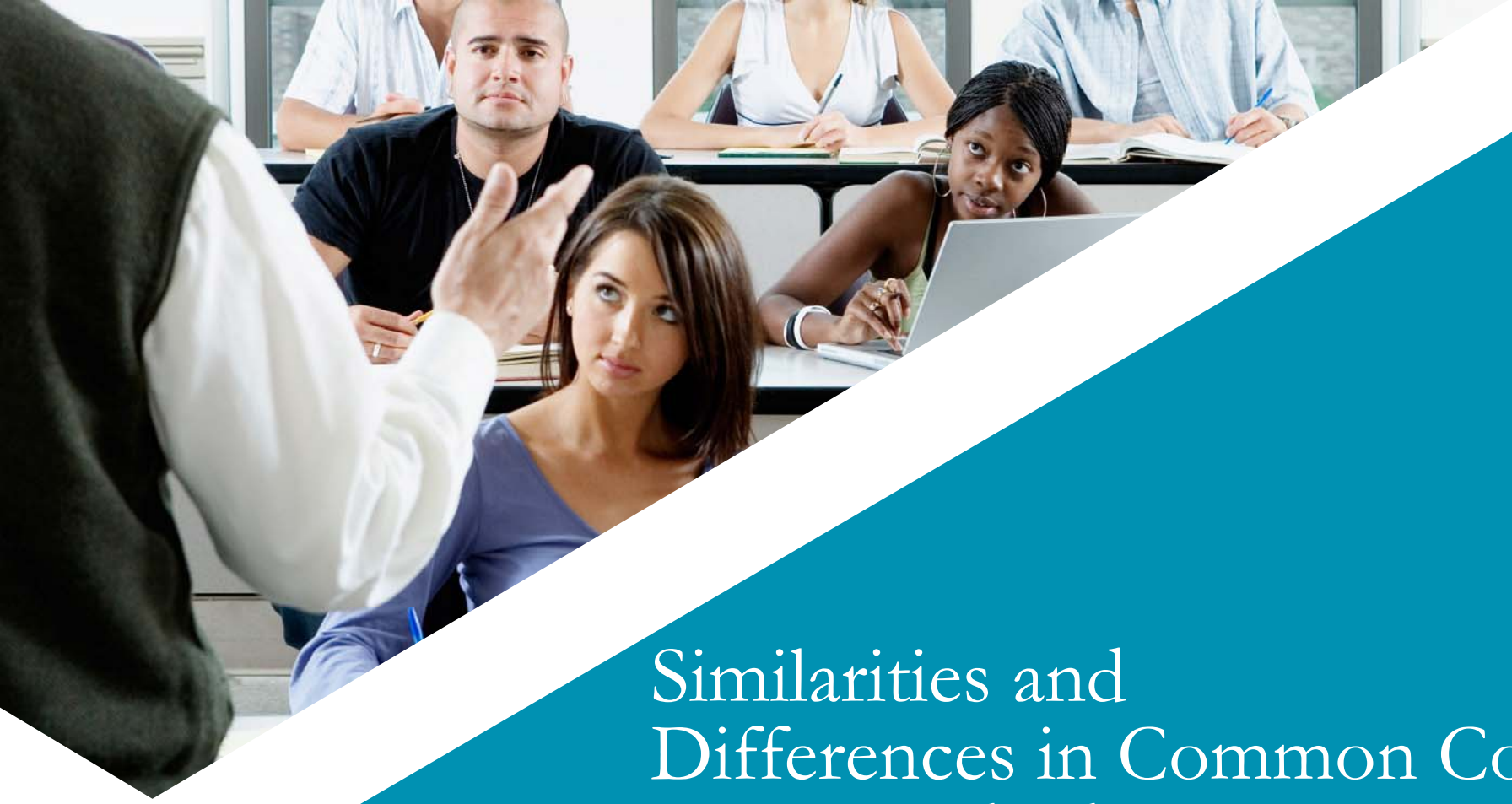
Agenda

- Overview of the Conceptual Framework for Science and Next Generation Science Standards Development Process
- Vision for the Next Generation of Science Standards



Similarities and Differences in Common Core State Standards Process and Next Generation Science Standards

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Similarities and Differences in CCSS and Next Generation Science Standards

Similarities	Differences
States provide key leadership role in development and feedback of Next Generation Science Standards	Two Step Process Scientific community provides key leadership role in the Conceptual Framework Development
Broad Stakeholder Engagement	The field of science standards development is in a different place than ELA and mathematics
State engagement in development and feedback	States are not being asked to sign on prior to development
Development of rigorous, internationally benchmarked, college and career ready standards	States will decide after the standards are developed to adopt individually or in "common"

Overview of Science Development Process

NRC Process

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Why Science? Why now?

Why New Science Standards?

- Previous documents from the National Research Council (NRC) and American Association for the Advancement of Science (AAAS) used to guide science education are over 10 years old
- New developments in cognitive science
- Rapid advances in the natural sciences and engineering
- Call for new, internationally-benchmarked standards

Conceptual Framework for Science and the Next-Generation Science Standards

The Framework and Standards will

- Impart a coherent and sharpened focus on the core ideas of the major fields
- Take into consideration the knowledge and skills required for science literacy, college readiness, and for pursuing further study in STEM fields
- Integrate conceptual knowledge and science practices
- Base decisions on evidence—to the degree possible—as well as on professional judgment
- Reflect the expectations that high-performing countries hold for students
- Provide a platform for the development of aligned, high quality assessments, curricula and instructional materials.

Conceptual Framework for Science and the Next-Generation Science Standards

Two-Step Development Process

- Carnegie Corporation of New York is funding two phases of work led by NRC and Achieve, linked by a joint work plan
- National Research Council (NRC) will create a conceptual framework for the new standards that will identify and articulate the core ideas by early 2011.
- AAAS and NSTA and Achieve are working in partnership with NRC to solicit feedback on the framework
- Achieve will take the lead in developing aligned science standards in partnership with states and key stakeholders by late 2011 or early 2012.
- State and educator involvement is critical to the successful development and implementation of high-quality science standards

Development Process Principles for Conceptual Framework and Next Generation Science Standards

- Transparency
- Partnership
- Broad involvement of stakeholders
- Expert review

Two Step Process

Conceptual Framework for Science Development

- Scientific community provides key leadership in development
- Feedback from all stakeholders including states, K-12 educators, scientific community, higher education, business community and general public will be considered during development

Standards Development

- States and educators provide key leadership in development
- Feedback from all stakeholders including states, K-12 educators, scientific community, higher education, business community and general public will be considered during development
- NRC members will check for fidelity of standards with framework

What is purpose of the Conceptual Framework for Science ?

"The Framework is designed to help realize a vision for science and engineering education in which students actively engage in science and engineering practices in order to deepen their understanding of core ideas in science over multiple years of school." – NRC Draft Framework

- Ensure accuracy of science content and practice
- Provide intellectual guidance for the standards
- Blend current understanding of teaching and learning with new developments in science

How is the Conceptual Framework for Science different from standards?

- Conceptual Framework – representation of core ideas in science with examples of performance expectations

- Standards – elaboration of core ideas into K-12 learning expectations

The National Academies

- A non-governmental organization (NGO)
- Founded in 1863
- Bring together committees of experts in all areas of scientific and technological endeavor
- Address critical national issues and give advice to the federal government and the public

Phase I – NRC Study Committee

- Highly respected scientists from multiple disciplines
- Experts on science education
- Experts on learning sciences
- Experts on education systems and policy
- Supported by 4 design teams

Committee Members

Helen Quinn, Chair Stanford University (Physics)

Wyatt Anderson, University of Georgia (Biology)

Tanya Atwater, UC Santa Barbara (Earth Sciences)

Philip Bell, University of Washington (Learning Sciences)

Thomas Corcoran, Center for Policy Research in Education, Columbia Teachers College

Rodolfo Dirzo, Stanford University (Ecology)

Phillip Griffiths, Princeton University (Mathematics)

Dudley Herschbach, Harvard University (Chemistry)

Linda Katehi, UC Davis (Engineering)

John Mather, NASA, (Astrophysics)

Brett Moulding, Educator, Utah

Jonathan Osborne, Stanford University (Science Education)

James Pellegrino, University of Illinois at Chicago (Learning Sciences)

[Stephen L. Pruitt, Office of the State Superintendent of Schools, Georgia Department of Education]

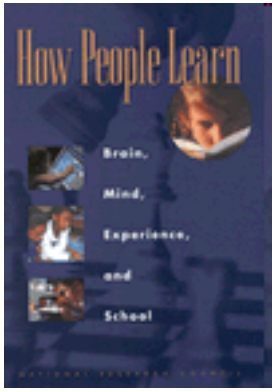
Brian Reiser, Northwestern University (Learning Sciences)

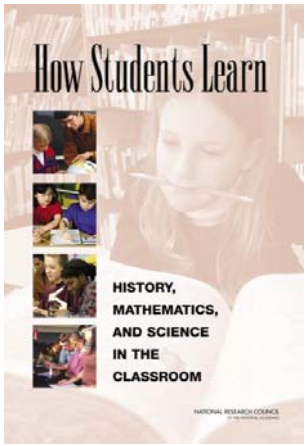
Rebecca Richards-Kortum, Rice University (Engineering)

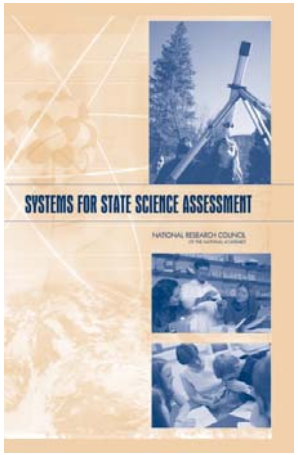
Walter Secada, University of Miami (Mathematics)

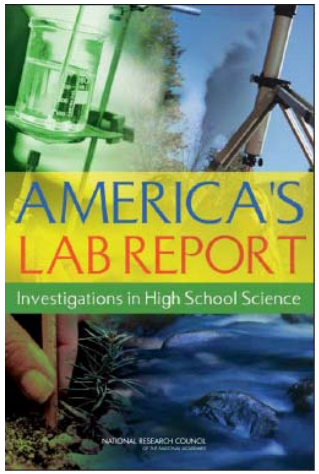
Deborah Smith, Pennsylvania State University (Elementary Education)

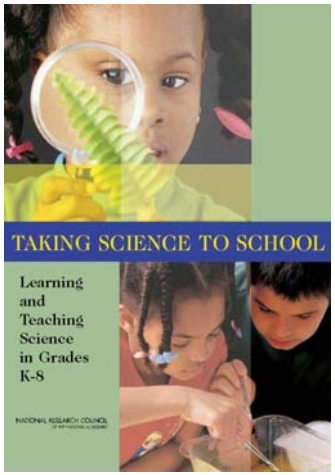
A Framework based on Research on Learning and Teaching

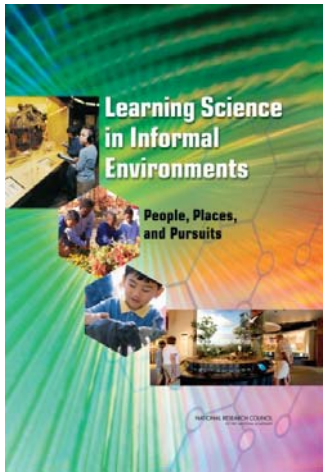












Phase I – NRC Process for Development of the Conceptual Framework for Science

- Build on current initiatives and past experiences
- Hold stakeholder meetings for informed input
- Conduct study committee and design teams
- Draft conceptual framework released July 12, 2010
- Seek public feedback
- Finalize draft in early 2011

Unique Aspects of the Conceptual Framework Project

- Speed of project
- Includes Engineering and Technology
- Partnership
- Design teams
- Public feedback on draft
- Check for fidelity of standards with framework

Principles of the Framework

- Children Are Born Investigators
- Understanding Develops Over Time
- Science Is More than a Body of Knowledge
- Connecting to Students' Interest and Experience
- Promoting Equity

Phase II – Achieve Process for Development of Next Generation Science Standards

After the final Conceptual Framework for Science is released by the NRC in 2011, Achieve will engage states and other key stakeholders (including CCSSO, NGA, SHEEO) in the development and review of the new standards

- Writing Teams
- Critical Stakeholder Team
- Strategic Advisory Team
- Comprehensive Feedback Loops

Revision of multiple standards' drafts based on stakeholder and public input

NRC Study Committee members to check the fidelity of standards based on framework

Highlights of the Conceptual Framework for Science Education

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Core Ideas

A core idea for K-12 science instruction is a scientific idea or practice that:

- Has broad importance across multiple science and/or engineering disciplines and/or is a key organizing concept of a single discipline
- Provides a key tool for understanding or investigating more complex ideas and solving problems
- Relates to the interests and life experiences of students or can be connected to societal or personal concerns that require scientific or technical knowledge
- Is teachable and learnable over multiple grades at increasing levels of sophistication and depth

Cross-cutting Scientific Concepts:

- Patterns, similarity, and diversity
- Cause and effect: mechanism and prediction
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter: flows, cycles and conservation
- Form and function
- Stability and change

Topics in Science, Engineering, Technology and Society:

- History and Cultural Roles of Science, Engineering and Technology
- Impacts of Science, Engineering, and Technology on Society
- Impact of Societal Norms and Values on the Practices of Science and Engineering
- Professional Responsibilities of Scientists and Engineers
- Roles of Scientific and Technical Knowledge in Personal Decisions
- Careers and Professions Related to Science and Engineering

Scientific and Engineering Practices for Science Classrooms

- Asking Questions
- Modeling
- Devising Testable Hypotheses
- Collecting, Analyzing, and Interpreting Data
- Constructing and Critiquing Arguments
- Communicating and Interpreting Scientific and Technical Texts
- Applying and Using Scientific Knowledge

Remaining Chapters – Guiding Standards

- Putting the Dimensions Together: Performance Expectations
- Prototype Learning Progressions

Contact Information

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