

The NRC Framework for K-12 Science Education and the Next Generation Science Standards

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THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

National Academy of Sciences
National Academy of Engineering
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National Research Council

The National Academies

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

Goals for Science Education

“The Framework’s vision takes into account two major goals for K-12 science education:

- (1) Educating all students in science and engineering.
- (2) Providing the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future.

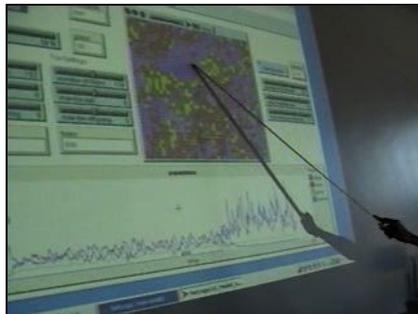
The Framework principally concerns itself with the first task —what all students should know in preparation for their individual lives and for their roles as citizens in this technology-rich and scientifically complex world.” Page 10

The Vision of the Framework

“The Framework is designed to help realize a vision for education in the sciences and engineering in which (all) students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.”
(pages 8-9)

Framework's 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



Framework's Crosscutting Concepts

- Patterns*
- Cause and effect: Mechanism and explanation*
- Scale, proportion, and quantity
- Systems and system models*
- Energy and matter: flows, cycles, conservation
- Structure and function
- Stability and change

DRAFT NGSS lettered performance expectations

- K Weather – a, b, c
- K Organisms and Their Environment – d
- 1 Patterns and Cycles – b
- 2 Interdependence of Organisms and Their Surroundings – a,f
- 3 Weather, Climate and Impacts – b

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- 4 Processes that Shape the Earth – b
 - 4 Energy – c, f
 - 5 Earth Systems and Their Interactions – c,d,f,g,h
 - Middle School Human Impacts – a,b,c,d
 - High School Climate Change – a,b,d,e,f

Expected Shifts

- Standards as performance expectations
- Integrating the 3 dimensions
- Science learning progresses K-12
- Integration of science and engineering
- Coordination with Common Core – Math and Common Core – ELA
- Science for all

Shifts in How Science Should Be Taught in Classrooms

- Organize curriculum materials around limited number of core ideas: depth and coherence, not breadth of coverage.
- Core ideas should be revisited in increasing depth, and sophistication across years. Focus on connections:
 - Careful construction of a storyline – helping learners build sophisticated ideas from simpler explanations, using evidence.
 - Connections between scientific disciplines, using powerful ideas (nature of matter, energy) across life, physical, and earth science
- Curriculum materials should involve learners in practices that develop, use, and refine the scientific ideas, not “explain” the science *for* students.

Free PDF version of *A Framework for K-12 Science Education* is available at:

<http://tinyurl.com/ScienceFramework>

<http://tinyurl.com/ScienceBrief> (report brief)

For Updates on Next Gen Science Standards:

<http://www.nextgenscience.org/>

<http://nas.edu/BOSE>