Frequently Asked Questions About the

Science Standards for Alaska

# PURPOSE OF THE NEW SCIENCE STANDARDS FOR ALASKA

## **Q: Why new science standards? Why now?**

A: Science—and therefore science education—is central to the lives of all Americans, preparing them to be informed citizens in a democracy and knowledgeable consumers.  If the nation is to compete and lead in the global economy and if Alaskan students are to be able to pursue expanding employment opportunities in science-related fields, all students must have a solid K–12 science education that prepares them for college and careers. The state’s previous content and performance standards for science (GLEs) are now more than 14 years old. Needless to say, major advances have since taken place in the world of science and in our understanding of how students learn science effectively. The time was right to take a fresh look and update Alaska’s science standards.

# CONTENTS AND RESEARCH BACKGROUND OF THE STANDARDS

## **Q: How are critical thinking and communications skills, which are fundamental to student success in today’s global economy, addressed in the new Science Standards for Alaska?**

A: It is important to understand that the scientific practices in the Science Standards for Alaska (SSA), as defined by the National Research Council’s (NRC) *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*, include the critical thinking and communication skills that students need for postsecondary success and citizenship in a world fueled by innovations in science and technology. These science practices encompass the habits and skills that scientists and engineers use day in and day out. In the SSA these practices are wedded to content. In other words, content and practice are intertwined in the standards, just as they are in the NRC [*Framework*](http://sites.nationalacademies.org/dbasse/bose/framework_k12_science/index.htm) and in today’s workplace.

## **Q: How do the standards take into account current research in cognitive science?**

A: Research on how students learn science effectively has been a long-term interest of the NRC, which published [How People Learn](http://www.nap.edu/openbook.php?isbn=0309070368), [How Students Learn](http://www.nap.edu/catalog.php?record_id=10126), [Taking Science to School](http://www.nap.edu/catalog.php?record_id=11625), and [Education for Life and Work](http://www.nap.edu/catalog.php?record_id=13398).  Findings in cognitive science permeate the [*Framework for K-12 Science Education*](http://sites.nationalacademies.org/dbasse/bose/framework_k12_science/index.htm) and were central to the development of the Science Standards for Alaska (SSA).

## **Q: What are core ideas in science?**

A: The NRC defines disciplinary core ideas as those that focus K–12 science curriculum, instruction, and assessments on the most important aspects of science disciplinary content knowledge. In order to identify the relevant core ideas for K–12 level science, the NRC [*Framework*](http://sites.nationalacademies.org/dbasse/bose/framework_k12_science/index.htm) Committee developed and applied a set of criteria.  To be considered "core,” the ideas had to meet at least two of the following criteria and ideally all four:

1. Have broad importance across multiple sciences or engineering disciplines or be a key organizing principle of a single discipline;
2. Provide a key tool for understanding or investigating more complex ideas and solving problems;
3. Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge;
4. Be teachable and learnable over multiple grades at increasing levels of depth and sophistication.

Design teams working in four domains—life sciences, physical sciences, earth and space sciences, and engineering and technology—supported the work of the Committee on core ideas by examining related research and key documents. These included recent research on teaching and learning science, much of which has been summarized in previous reports from the NRC—[How People Learn](http://www.nap.edu/openbook.php?isbn=0309070368), [Taking Science to School](http://www.nap.edu/catalog.php?record_id=11625), [Learning Science in Informal Environments](http://www.nap.edu/catalog/12190/learning-science-in-informal-environments-people-places-and-pursuits), [Systems for State Science Assessment](http://www.nap.edu/catalog/11312/systems-for-state-science-assessment) and [America’s Lab Report](http://www.nap.edu/catalog/11311/americas-lab-report-investigations-in-high-school-science). The Committee and design team members also reviewed the NAEP 2009 Science Framework, the College Board Science Standards for College Success, the National Science Teacher Association's Science Anchors initiative, and such seminal documents as the National Science Education Standards developed by the NRC and the Benchmarks for Science Literacy developed by American Association for the Advancement of Science (AAAS).

## **Q: What are scientific practices?**

A: Like previous editions of science standards from the NRC and the American Association for the Advancement of Science (AAAS), the SSA also include engineering practices, which are the behaviors that engineers engage in as they apply science and mathematics to design solutions to problems. Although engineering design is similar to scientific inquiry, there are significant differences. For example, scientific inquiry involves the formulation of a question that can be answered through investigation, while engineering design involves the formulation of a problem that can be solved through design. Strengthening the engineering aspects of the Science Standards for Alaska will clarify for students the relevance of science, technology, engineering, and mathematics (the four STEM fields) to everyday life. And engaging in these practices help students become successful analytical thinkers, prepared for college and careers.

## **Q: What are crosscutting concepts?**

A: The NRC Framework describes crosscutting concepts as those that bridge disciplinary boundaries, having explanatory value throughout much of science and engineering. Crosscutting concepts help provide students with an organizational framework for connecting knowledge from the various disciplines into a coherent and scientifically based view of the world. These concepts are:

1. Patterns;
2. Cause and Effect;
3. Scale, Proportion, and Quantity;
4. Systems and System Models;
5. Energy and Matter;
6. Structure and Function; and
7. Stability and Change.

The [*Framework*](http://sites.nationalacademies.org/dbasse/bose/framework_k12_science/index.htm) also emphasizes that these concepts need to be made explicit for students because they provide an organizational schema for interrelating knowledge from various science fields into a coherent and scientifically-based view of the world.

# STANDARDS DEVELOPMENT PROCESS

## **Q: How were committee members selected?**

A: The Alaska Department of Education & Early Development (DEED) solicited a pool of potential reviewers from the Alaskan educational community at conferences events and via electronic communications such as the Alaska Science Teachers Association listserv, the DEED Career and Technical Education listserv, social media, and direct emails to district superintendents and curriculum directors.

## **Q: Who was involved in the development of the *Science Standards for Alaska*?**

A: The development of the *Science Standards for Alaska*(SSA) was a state-led effort. The Writing and Review Committees consisted of K–12 teachers, higher education faculty, scientists, engineers, cognitive scientists, and business leaders. The Alaska Department of Education & Early Development managed the development process.

## **Q: What were the roles of the Writing Committee?**

A: The Science Standards **Writing Committee** was responsible for “writing” the science content standards. Writing Committee members had a deep understanding of science instruction and assessment, science content and skills, and applications of science knowledge and skills. The Writing Committee, to the extent practicable, represented the diversity of Alaska’s educational settings and communities. Writing Committee members worked both individually and as a group to accomplish the following tasks:

1. Identify and review influential sets of science content standards.
2. Identify, modify, write, and compile a recommended set of science content standards drawing on its members’ expertise and review of relevant materials.
3. Following peer review, make appropriate changes.

## **Q: What were the roles of the Review Committee?**

**A: The Science Standards Review Committee was responsible for reviewing and providing detailed feedback on the content standards recommended by the Writing Committee. Review Committee members had a deep understanding of science instruction and assessment, science content and skills, and applications of science knowledge and skills. The Review Committee represented the diversity of Alaska’s educational settings and communities. The Review Committee worked individually to review drafts of the recommended science standards, and provide written feedback, including suggested changes, to the Writing Committee.**

## **Q: What standards were considered as examples?**

A: DEED and the Center for Assessment ask the writing committee to consider multiple standards from across the nation. These included:

1. The *Next Generation Science Standards*
2. The *Framework for K-12 Science Education*
   1. Science standards from other leading states, including Washington, California, Nevada, Georgia, and Kentucky
3. Science standards for the NAEP, PISA, and TIMSS assessments
4. Science standards from College Board and ACT
5. Past science standards such as AAAS’ Project 2061

## **Q: How were the standards developed?**

A: Development of the science content standards was an iterative process involving multiple review and improvement cycles. The writing committee initially identified a foundational set of standards for review based on the examples noted. The committee was split into three grade spans: elementary, middle, and high school. They then conducted a standard-by-standard review for all grades in their given span for relevance and applicability to Alaska. Where appropriate, the committee added or deleted standards as determined by their professional experience. The review committee provided comments and feedback on the draft standards developed by the writing committee in a continuous improvement cycle repeated twice.

## **Q: Was there an opportunity for the general public to submit feedback on the standards during the development process?**

A: Yes. The Science Standards for Alaska (SSA) had a public feedback period prior to the finalization of the standards. The standards were made available via a web-based survey and from the State Board of Education’s website. Public comment and feedback was gathered from the survey, direct emails, in writing, and via oral testimony. In addition to the public feedback, teachers, scientific and educator organizations, higher education faculty, scientists, and business community members reviewed drafts at specific intervals.

## **Q: How are the Science Standards for Alaska aligned to the National Research Council’s Framework for K-12 Science Education?**

A: The Science Standards for Alaska (SSA) were developed from the National Academies Framework and consultation of other states’ science standards. They are fully aligned to the vision and purpose of the *Framework for K-12 Science Education*.