



The following article, authored by NSTA Past President Harold Pratt, is the first in a series of articles by NSTA that explore the development, role, content, and implications of the soon-to-be-released Conceptual Framework for Science Education.

**Anticipating the *Conceptual Framework for Science Education*:
An in-depth look at its development, role, possible content, and relationship to standards**

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A Collaborative Process to Develop *Next Generation Science Standards*

To better understand the current process of developing the *Conceptual Framework for Science Education* and *Next Generation Science Standards*, it is helpful to review the development of the first set of science standards released in 1996 by the National Research Council (NRC)*. At that time, the work was supported with government funding and took three years to complete. Today, the funding and development process for a new set of science standards has taken a different direction. With private funding from the Carnegie Corporation, and with support from NSTA and the American Association for the Advancement of Science (AAAS), the NRC and Achieve** have embarked on a two-step cooperative process to develop science standards. The first step is to develop a *Conceptual Framework* that is grounded in current research on science and science learning and identifies the science all K–12 students should know. NRC is conducting this work using its normal study procedures. The next step, led by Achieve, will be developing the actual standards, a process that involves science experts, science teachers, states, and other science education partners. This two-step process takes a broader, more cooperative approach to developing science standards.

In July 2010, NRC released a draft *Conceptual Framework for Science Education*, which was a departure from its standards study procedures. The science community welcomed the chance to read this draft and provide input. NSTA conducted an extensive review of the draft and secured in-depth feedback from science educators. This input, along with a set of recommendations, was submitted to NRC to consider as it began work on the final document, which is expected to be released in late Spring 2011. AAAS, the Council of State Science Supervisors (CSSS), and many other groups and individuals also provided feedback and responded to an online survey.

When the final *Conceptual Framework* is released, several of its writers will work with Achieve to develop standards that are faithful to the vision and direction in the *Conceptual Framework*. Additional writers have been selected and several members of NSTA are members of the team. Look for more details about this process in a future installment in this article series.

Although the work to develop the *Conceptual Framework* and *Next Generation Science Standards* is not a part of the Common Core Standards initiative, its intent is to guide the development of science standards that become a part of a common set of standards that all states can adopt.

Understanding a Conceptual Framework

A framework is a basic conceptual structure of ideas; in education, many versions of frameworks exist. Numerous states and school districts have developed frameworks as part of their science education policy and curriculum documents to guide the science education process. Usually these frameworks—which vary from state to state or district to district—are designed to accompany or support the use or implementation of the standards already in place in the district or state.

The NRC *Conceptual Framework* released last summer presented the NRC’s vision of the “scope and nature of the education in science and engineering that is needed in the 21st century.” It described the major scientific ideas and practices in science and engineering that all students should know by the end of high school. The approach will help science educators understand the basic conceptual ideas in science that are most important for students to learn and the best sequence for teaching them. Conceptual ideas are not as specific as standards. The *Conceptual Framework*, for example, might include the importance of natural cycles in understanding the natural sciences, but it would not include specific standards for each grade level. This level of detail will be left for the science standards.

The goal of the *Conceptual Framework* is to move science education toward a more coherent vision. The final version is expected to focus on a limited number of core ideas in science and engineering, both within and across disciplines. This should reduce the number of science topics so that teachers can avoid shallow coverage of a large number of topics and allow more time for students to explore the reduced number of ideas in greater depth. Reduction of the sheer sum of details to be mastered gives students time to engage in scientific investigations, argumentation, and communication and to achieve a depth of understanding of the core ideas.

The NRC’s description of the *Conceptual Framework* and its goals is well stated on its website:

“The conceptual framework developed by the NRC will provide an overarching vision of what it means to be proficient in science; it will rest on a view of science as both a body of knowledge and an evidence-based model and theory building enterprise that continually extends, refines, and revises knowledge. It will present and explain the interrelationships among core ideas, concepts and practices. The framework will identify core ideas in science and key practices that can guide an effort to create a set of standards that will allow for teaching of science in greater depth. Importantly, the framework will be guided by recent research in how students learn science effectively.”

The NRC expects the final *Conceptual Framework* to be a guide not only for standards developers but also for curriculum designers, assessment developers, state and district science administrators, those responsible for science teacher education, professional developers, and science educators working in informal settings.

Possible Content of the NRC *Conceptual Framework*

NRC's study process prevents anyone, including NSTA, from knowing the content of the final *Conceptual Framework*. Based on the content of the draft version released last summer, however, it is possible to speculate in this article. NSTA will provide more concrete information about the framework once the final version is released.

The core ideas from the three major disciplines of physical, life, and Earth and space science will most likely be present. Engineering and technology will be a possible fourth discipline or it may be included as a cross-cutting theme. In any event, engineering and technology will be a significant new element in the *Next Generation Science Standards*. Cross-cutting themes most likely will be a major new component that may include many of the Common Themes from the *Benchmarks for Science Literacy* and the Unifying Concepts and Processes from the *National Science Education Standards (NSES)*, as well as content similar to the Standards for Science in Personal and Social Perspectives in *NSES*. One major change in the *Conceptual Framework* draft was the introduction of Scientific and Engineering Practices, which to some degree, encompassed and expanded on the inquiry standards in *NSES*. These scientific practices come from the NRC reports about learning science.

Because the final framework may be quite different from the draft, speculation is somewhat risky. Nevertheless, science educators should be prepared for the *Conceptual Framework* to include some important changes from the expectations in the *NSES*, *Benchmarks*, and many, if not most, state standards.

The Difference Between the Conceptual Framework and Next Generation Science Standards

Since both documents have not been released, we can only speak in general terms about the differences between these documents. The *Conceptual Framework* will shape the content of the standards but will be quite different from the standards. The framework will provide outlines and a "frame" for the science content: what is core to learning science and how those ideas are related to all the other ideas in science. It might discuss why there are cross-cutting themes in science and how these themes relate to science content. It might introduce scientific practices and describe the way science is done and, therefore, discuss why these practices have major implications for how science is taught.

It is sometimes helpful when describing something to say what it is not. In this case, the *Conceptual Framework* will not provide grade-by-grade expectations for students that can be used in classrooms. Rather, it will represent a framing of the science discipline, what we know about learning science, and what is unique and most important for all students to know about science. In this role the framework will guide science education for years to come.

The *Conceptual Framework* may contain a few sample standards to assist Achieve in its work, but these standards will not be for final use or publication. Standards are designed to be much more specific and focused on student outcomes. Standards describe the outcomes or

explicit expectations of students at each grade or grade span. They describe what the student should know or be able to do, but they are not assessments. Assessments are not typically included in standards but are developed by assessment experts and carefully aligned with standards. The standards document most likely will contain elements derived from the *Conceptual Framework*, such as the vision for science education and discussion of what the implementation of the standards will require.

Looking Ahead

NRC is expected to release the *Conceptual Framework* soon and work will immediately begin on the *Next Generation Science Standards*, with release expected roughly one year after the release of the framework. Achieve is expected to make public drafts available at key times along the way. NSTA will use its news vehicles to disseminate information about both the framework and standards, including opportunities to review and comment on drafts of the *Next Generation Science Standards*. Look also for more of these informational articles to give a deeper perspective regarding many aspects of both the *Conceptual Framework* when it is released and the *Next Generation Science Standards*.

* The National Research Council (NRC) is the education research arm of the National Academies, a nongovernmental organization commissioned in 1863 to advise the nation on scientific and engineering issues. The Board on Science Education (BOSE) is the group within NRC overseeing the development of the *Framework*. (http://www7.nationalacademies.org/bose/Standards_Framework_Homepage.html)

**Achieve, Inc., is a private organization created in 1996 by the nation's governors and corporate leaders. It is an independent, bipartisan, nonprofit education reform organization based in Washington, D.C., that that helps states raise academic standards and graduation requirements, improve assessments, and strengthen accountability. (<http://www.achieve.org/next-generation-science-standards>)

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