MnSTA Newsletter, January 2012, John Olson, john.c.olson@state.mn.us

What are the *Next Generation Science Standards*?

You may have heard that new "national science standards" are being written. Many people are wondering if these standards will soon replace the 2009 Minnesota Science Standards that are being implemented and assessed this school year. Let me assure you that these potential standards are not likely to replace the Minnesota science standards anytime soon. Minnesota statute specifies that the next date for the revision of science standards is 2017-18. To change that date, the statute would have to be changed by the state legislature and the governor.

The new standards that are being written are called the "Next Generation Science Standards (NGSS)." They are not a product of the federal government, so they cannot dictate what states must do, nor are they Common Core standards like the Mathematics and Language Arts standards of 2010. However there are many aspects of this process that are beneficial for improving instruction and so it is wise to keep track of the developments that are taking place.

The science education community, including the National Science Teachers Association, began an effort a few years ago toward revising our national standards. Our current foundational standards documents, the *Benchmarks for Science Literacy* and the *National Science Education Standards* are now about fifteen years old. Scientific knowledge and our understanding about learning science have advanced since then.

The National Research Council (NRC) gathered leading scientists and science educators to determine the concepts that students should learn to be college and career ready. This work resulted in the *Framework for K-12 Science Education: Practices, Core Ideas and Cross Cutting Concepts.* (NRC Frameworks) This document, released in July, presents the vision of science education as "(S)tudents, 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." (*Framework*, p. I-2) It is both a guide for changes in science education and a foundational document for the development of the Next Generation Science Standards.

The meaning of the word "framework" in this document is used quite differently than our Minnesota online resource called the *Frameworks for Minnesota Mathematics and Science Standards.* (www.scimathmn.org/stemtc) The *NRC Framework* is intended as a source for writing national standards and the *Minnesota Frameworks* is a resource for instruction that implements Minnesota standards. To clarify the difference we sometimes refer to "conceptual framework" for the NRC document and "instructional frameworks" for the Minnesota website.

The *NRC Framework* is the first step for writing the NGSS, however it is also provides ideas for instruction that are worth studying and applying in our classrooms and curriculum planning. The Framework describes eight Science and Engineering Practices that are important to incorporate into instruction, such as, asking question, developing models, carrying out investigations and engaging in argumentation from evidence.

The Core Ideas are the concepts students should learn in the disciplines of Physical Science, Earth and Space Science, and Engineering, Technology and the Applications of Science. The Cross Cutting Concepts are seven big ideas that cut across the discipline areas, such as, patterns, cause and effect, systems and energy.

The writing of the *Next Generation Science Standards* began in late summer. About 40 writers from 22 states are involved in the work. About half are classroom teachers, including Mary Colson, earth science teacher from Moorhead. The writers are using the *NRC Framework* to guide their efforts at weaving together the practices, core ideas and cross cutting concepts into standards statements. Their goal is present a draft for public review by the end of March and a final product by the end of the year.

Minnesota is designated as a "lead state" in the development of the NGSS. A committee of 30 teachers and other educators are providing feedback to drafts of the standards as they being developed. Other committees are working on dissemination of ideas from the *NRC Framework* and considering the impact of the NGSS on Minnesota. There will be a session on the *NRC Framework* and the NGSS at the Minnesota Conference on Science Education in Duluth and there will be additional workshops, especially in connection with the public draft in April.

The NRC Framework and a summary can be downloaded at the Standards section of the Minnesota Frameworks (www.scimathmn/stemtc). The website for the development of the NGSS is http://www.nextgenscience.org.

1. Science and Engineering Practices	**3. Disciplinary Core Ideas**
1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 3. Planning and carrying out investigations. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking. 6. Constructing explanations (for science) and designing solutions (for engineering). 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	Physical Sciences PS 1: Matter and its interactions PS 2: Motion and stability: Forces and interactions PS 3: Energy PS4: Waves and their applications in technologies for information transfer Life Sciences LS 1: From molecules to organisms: Structures and processes LS 2: Ecosystems: Interactions, energy, and dynamics LS 3: Heredity: Inheritance and variation of traits LS 4: Biological evolution: Unity and diversity Earth and Space Sciences ESS 1: Earth's place in the universe ESS 2: Earth's systems ESS 3: Earth and human activity Engineering, Technology, and the Applications of Science ETS 1: Engineering design ETS 2: Links among engineering, technology, science, and society
2. Crosscutting Concepts: unify the study of science and engineering through their common application across fields (ES-1)	
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	