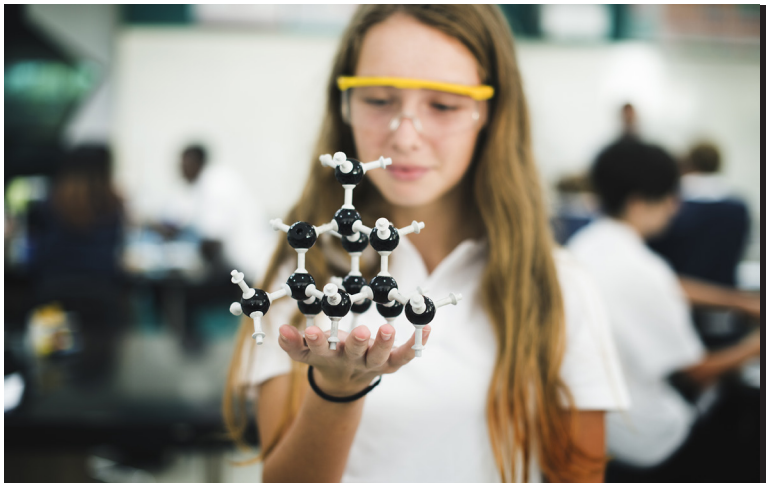


ALN
ASSESSMENT LEARNING NETWORK

LEARNING POINT

What are Next Generation Science Standards?

The Next Generation Science Standards (NGSS) are a set of research-based, up-to-date K–12 science content standards that set new expectations for what students should know and be able to do in science. The NGSS were developed through a collaborative process led by 26 states to improve science education for all students.

How does the MAC define "standards"?

Standards are the larger expectations or goals expressed in association with knowledge, skills and dispositions, comprising entire disciplines (mathematics, science, etc.)

Source: Assessment Literacy Standards Glossary

The new K–12 science standards, released nationally in 2013 and adapted by the Michigan State Board of Education as the Michigan K-12 Science Standards in 2015, are based on *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas,* developed by the National Research Council (NRC).

The NGSS describe "performance expectations" that articulate what students should know and be able to do at each grade level. Each performance expectation integrates the three dimensions that support science learning (see figure 1):

- Cross-Cutting Concepts (unifying ideas that bridge all areas of science)
- Science and Engineering Practices (the practices of engaging in scientific investigation to answer questions, and engineering design to solve problems)
- Disciplinary Core Ideas (science specific content in the life, earth, and physical sciences)

Each dimension is integrated with the other two to provide targets for students to build a cohesive understanding of science over time.

The science expectations are also interwoven across disciplines, including connections to language arts and mathematics. The adoption of new standards provides an opportunity not only to improve science learning, but also to improve literacy and thinking skills of all students.

NGSS in Michigan

In November 2015, after more than two years of review, the Michigan State Board of Education adopted new standards for science. The new Michigan K-12 Science Standards (MSS) are based upon the NRC Framework and the Next Generation Science Standards. They replace the standards adopted in 2006, commonly known as the Grade Level Content Expectations and High School Content Expectations for Science.

To learn more

- **Next Generation Science Standards**
  Offers background; detailed information; and a quick search of the NGSS by keyword, grade, practice, crosscutting concept, and disciplinary core idea.
  http://nextgenscience.org
- **Michigan's Science Standards**
  https://www.michigan.gov/documents/mde/K-12_Science_Performance_Expectations_v5_496901_7.pdf
- **Guide to Implementing the Next Generation Science Standards**
  (2015) National Research Council (Chapter 6 addresses assessment specifically)
  http://nap.edu/catalog/18802/guide-to-implementing-the-next-generation-science-standards
- **Seeing Students Learn Science: Integrating Assessment and Instruction in the Classroom (2017) National Academy Press**
  https://bit.ly/3MJM0sN

The Michigan Department of Education calls the MSS "standards with a purpose" that cover every grade and every scientific discipline. A major difference between the MSS and previous science standards is "three-dimensional" (3D) learning. 3D learning refers to the thoughtful and deliberate integration of the three dimensions within the NGSS: Scientific and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs).

"Through 3D learning, the MSS emphasize that science is not just a series of isolated facts. This awareness enables students to view science more as an interrelated world of inquiry and phenomena rather than a static set of science disciplines. The MSS represent a fundamental shift in science education and require a different approach to teaching science than has been done in the past. Looking ahead, teachers can use a range of strategies to engage students and create opportunities to demonstrate their thinking and learning."[1]

The NGSS are not a curriculum

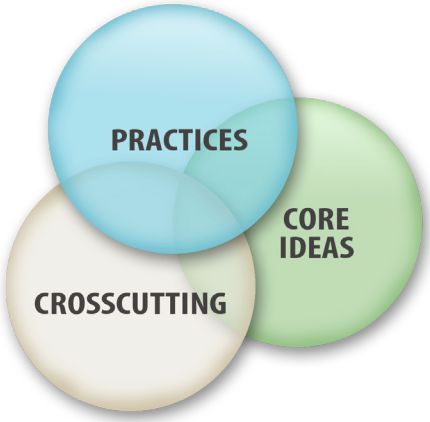
The NGSS are not a curriculum; rather, they are goals that reflect what a student should know and be able to do at the end of instruction. The performance expectations are written in a way that expresses the concept and skills to be performed (i.e., defines the goals for learning) but still leaves curricular and instructional decisions (i.e., steps to help students achieve the standards) to states, districts, schools and teachers. In fact, one goal for developing the NGSS was to give local educators the flexibility to design classroom learning experiences that stimulate students' interests and engage local contexts in science while preparing them for college, careers, and citizenship.

New standards, new opportunities for science assessment

A new system of assessments – using new types of assessment tools— will be needed to measure student learning as the NGSS begin to be implemented. Developing assessments that address the rich, multidimensional learning described in the Framework and NGSS comes with some significant challenges. These challenges are described in more detail in a separate ALN Learning Point entitled: *What Impact Will Next Generation Science Standards Have on Assessment?* With thoughtful and collaborative implementation, these new standards provide the opportunity to re-imagine science instruction and assessment and enhance science learning for all students.

Figure 1.

Crosscutting Concepts help students explore connections across the four domains of science, including Physical Science, Life Science, Earth and Space Science, and Engineering Design. When these concepts, such as "cause and effect," are made explicit for students, they can help students develop a coherent and scientifically-based view of the world around them.



Science and Engineering Practices describe what scientists do to investigate the natural world and what engineers do to design and build systems. The practices better explain and extend what is meant by "inquiry" in science and the range of cognitive, social, and physical practices that it requires. Students engage in practices to build, deepen, and apply their knowledge of core ideas and crosscutting concepts.

Disciplinary Core Ideas (DCIs) are the key ideas in science that have broad importance within or across multiple science or engineering disciplines. These core ideas build on each other as students progress through grade levels and are grouped into the following four domains: Physical Science, Life Science, Earth and Space Science, and Engineering.

Source: NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press. Retrieved 9.22.17 from www.nextgenscience.org.

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas

This 2011 report by the National Research Council identifies the key scientific ideas and practices all students should learn by the end of high school. It formed the basis for the Next Generation Science Standards. The Framework can also can be useful for curriculum and assessment designers, teacher educators, and others who work in K-12 science education.

Access the Framework at nap.edu/catalog.php?record_id=13165.

[1]Excerpt from: AN OVERVIEW FOR PRINCIPALS, Michigan Department of Education. Retrieved on 9.20.17 from michigan.gov/documents/mde/MSS_Admin_Overview_526898_7.pdf.