



LEARNING POINT

What Impact Will Next Generation Science Standards Have on Assessment?

The Next Generation Science Standards (NGSS) are a set of research-based, up-to-date K–12 science 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.

The new K–12 science standards, released nationally in 2013 and adapted by the Michigan State Board of Education in 2015, are based on *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* developed by the National Research Council (see related Learning Point: Next Generation Science Standards at aln.michiganassessmentconsortium.org).

New standards, new opportunities for science assessment

New types of assessments will be needed to measure student learning as the NGSS begin to be implemented. According to a 2014 report from the National Research Council, the tests that states have used in the past emphasize factual knowledge; they were not designed to assess the type of understanding envisioned by the standards, which emphasize depth of knowledge based on the ability to integrate core content with science and engineering practices.

The report calls for a new system of assessments and offers examples of the types of tasks and questions that could assess student understanding as described in the standards. To monitor progress in meeting the standards, the report says, states should:

- Use information both from state-administered tests and from classroom-based assessments

- Monitor information about students' opportunity to learn in the ways laid out in the science standards

"The Next Generation Science Standards present challenges for assessment, but they are also an opportunity to address longstanding limitations with current approaches," said committee co-chair James Pellegrino, Liberal Arts and Sciences Distinguished Professor and Distinguished Professor of Education at the University of Illinois at Chicago. *"Current assessments tend to ask students to define the scientific method absent specific content; assessments under NGSS should ask students to demonstrate that they understand aspects of scientific reasoning by applying particular science practices, such as designing a study or interpreting the meaning of a data set, to questions about genetic inheritance, for example."*

In the 2015 National Research Council's Guide to Implementing the Next Generation Science Standards, the authors make two recommendations regarding assessment:

- **"Recommendation 13:** Create a new system of science assessment and monitoring. State science education leaders should create a long-term plan to develop and implement a new system of state science assessments that are designed to measure the performance expectations in the Next Generation Science Standards. The system should incorporate multiple elements, including:
 - ◆ On-demand tests,
 - ◆ Classroom-embedded assessments, and
 - ◆ Measures of opportunity to learn at the state or district level.

"When possible, state science education leaders and those responsible for state assessment should consider developing partnerships, perhaps with other states, to facilitate the work of developing new science assessments.

- **"Recommendation 14:** Help teachers develop appropriate formative assessment strategies. School

To learn more

Next Generation Science Standards

nextgenscience.org

Guide to Implementing the Next Generation Science Standards (2015)

National Research Council (Chapter 6 addresses assessment specifically)
nap.edu/catalog/18802/guide-to-implementing-the-next-generation-science-standards

Developing Assessments for the Next Generation Science Standards

(2014) National Academies Press
nap.edu/18409

WestEd Center on Standards & Assessment Implementation

csai-online.org/collection/1565

Achieve

(click on Standards Science)
achieve.org/our-initiatives

leaders need to ensure that professional development for science teachers covers issues of assessment and supports teachers in using formative assessment of student thinking to inform ongoing instruction”

NGSS and science assessment in Michigan

In November 2015, after more than two years of review, Michigan’s State Board of Education adopted new standards for science based on the NGSS. The Michigan Department of Education calls the new Michigan K-12 Science Standards (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 distinct dimensions within the NGSS: Scientific and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs).

New State summative assessment in science

The new State summative assessment for the MSS has been in development since 2015. Following a period of extensive piloting and field testing, the MDE anticipates a complete transition to an MSS-aligned operational assessment in Spring 2020 (see figure 1 for timeline). The Office of Educational Assessment and Accountability (OEAA) has shared information and timelines regarding its plans for future science assessments on the state’s M-STEP website at michigan.gov/mstep.

The MDE OEAA regularly provides updates regarding Michigan’s science assessment transition in the MDE’s Spotlight publication, which is available online and through free subscription at the MDE website (michigan.gov/mde).

NGSS and formative science assessment

The MDE will also support science educators in the use of formative assessment processes and practices. This work is done primarily through the Formative Assessment for Michigan Educators (FAME) project, through which coach-supported learning teams work together to implement and sustain changes in teacher practice and student learning. Learn more by contacting Kimberly Young at youngk1@michigan.gov. Michigan also is a partner in the ACESSE project—a network of states, partnered with university researchers, seeking to develop

Coherent and Equitable Systems of State Science Education.

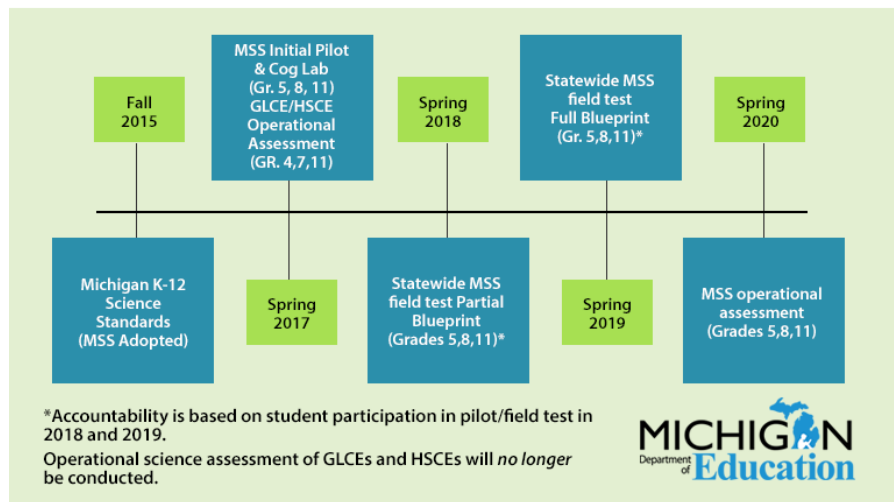
The Michigan Math and Science Centers Network (MMSCN) designed a series of virtual meetings in 2017-18 to focus on formative assessment practice nested inside mathematics and science. Each 1.5-hour meeting features a nationally known expert who engages participants in learning and sharing about formative assessment strategies. Recordings will be posted online by MMSCN. Learn more by contacting Mary Starr, Exec. Director or MMSCN at ststarm@mimathandscience.org.

Summary

Developing new assessments to address the rich, multidimensional learning described in the Framework and NGSS comes with some significant challenges. 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.

¹National Research Council. 2015. Guide to Implementing the Next Generation Science Standards. Washington, DC: The National Academies Press. P 61. doi.org/10.17226/18802.

Figure 1. Implementation timeline for Michigan’s science assessment



The NGSS standards require new assessment considerations that include

- A variety of assessment question formats (e.g. require students to supply an answer, produce a product, or perform an activity)
- Formative assessment practices to help teachers make instructional decisions and students to improve their learning tactics
 - ◆ Monitoring assessments would measure science learning on a broader scale
- External “on-demand” assessments (state summative assessments) supplemented with information gathered from classroom-embedded interim or periodic assessments (administered by schools/districts when it fits the instructional sequence in the classroom)
 - ◆ Self-contained curricular units that include both instructional materials and interim assessments, provided by the state or district to be administered in classrooms
 - ◆ State or district developed banks of tasks that schools and teachers would select from and use at the appropriate time in classrooms
- Assessments developed using a “bottom up” rather than a “top down” approach (e.g. begin with instruction and assessments designed for use in the classroom, then move toward assessment for monitoring purposes, including accountability)
- Tools that monitor indicators of students’ “opportunity to learn”
 - ◆ Extent to which science is taught in the way called for in the standards
 - ◆ Extent to which schools have the resources they need to support learning (e.g., teacher subject-area knowledge, adequate time, and appropriate materials to devote to science instruction)

The Michigan Assessment Consortium’s Assessment Learning Network (ALN), is a professional learning community consisting of members from MI’s professional education organizations; the goal of the ALN is to increase the assessment literacy of all of Michigan’s professional educators.