



Date: October 22, 2018

Prepared By: Ochoa

Purpose: Explore implementation of New Mexico STEM-Ready Science Standards.

Witness: Dr. Debra N. Thrall, Executive Board Member, New Mexico Science Teachers Association; Gwendolyn Perea Warniment, K-12 Program Director, LANL Foundation; and Stan Rounds, Executive Director, New Mexico Coalition of Educational Leaders

Expected Outcome: Understand the fiscal and infrastructure impacts of full implementation of New Mexico STEM-Ready Science Standards.

Implementation of New Mexico STEM-Ready Science Standards

Background

The Next Generation Science Standards (NGSS) represent the collaborative effort between states, science educators, and experts from across the United States. NGSS is intended to improve science education and prepare students for college, career, and 21st century skills.

According to Achieve, an independent, nonpartisan, nonprofit education reform organization, successful implementation of NGSS would require four core factors to be in place: educator support, informed stakeholders, high-quality instructional materials, and an effective assessment system. This brief focuses on educator support efforts, instructional materials, and development of an effective assessment system required to successfully implement the new standards.

Nineteen states and the District of Columbia have adopted NGSS. See **Attachment 1, Response to Information Request, Education Commission of the States.**

The Public Education Department (PED) adopted the New Mexico STEM-Ready Science Standards (NMSRSS) in 2017 to incorporate the (NGSS) in full, including performance expectations, core principles, scientific and engineering practices, and crosscutting concepts that unify science and engineering. The adoption included six additional standards specific to New Mexico.

Arkansas, California, Connecticut, Delaware, Hawaii, Illinois, Iowa, Kansas, Kentucky, Maryland, Michigan, Nevada, New Hampshire, New Jersey, New Mexico, Oregon, Rhode Island, Vermont, and Washington have adopted NGSS.

Educator Support

The changes required by the vision of the NGSS are significant enough that even the most veteran educators and school leaders will require support throughout the transition to the new standards. State education agencies should coordinate with school districts to ensure there is an aligned learning plan across the state. Professional development content must ensure teachers and school leaders understand scientific practices, disciplinary core ideas, and crosscutting concepts. School staff should also have a solid understanding of the larger scope of science instruction, including pedagogy and ensuring access and equity for all students. Because of the nature of NGSS, students

The District of Columbia partnered with institutions of higher education and the science community to increase their capacity in delivering college and career focused professional development for school staff.

are no longer “learning science”, they are “scientists”. NGSS supports project-based learning that is hands-on and driven by students. This means school staff must be exposed to actual lessons modeled with real students and work examples. Although lofty, ensuring that these components are in place will increase chances of teachers feeling prepared to authentically engage students in NGSS.

Illinois contracted with Illinois State University to support implementation of all content standards including professional learning and development of curriculum and instructional resources.

To address implementation of new standards, the Legislature increased appropriations for PED’s STEM initiatives. PED received \$3 million in recurring general fund revenues for their STEM initiatives, an increase of \$1.1 million compared with the FY18 appropriation of \$1.9 million. Additionally, the Legislature appropriated \$500 thousand in nonrecurring general fund revenue to PED specifically for implementation of the new standards. Generally, these dollars fund educator professional development and were intended to ensure teachers were prepared to begin teaching the new standards this school year. To date, PED has not budgeted the \$500 thousand nonrecurring funding and only appears to have encumbered \$779 thousand of the remaining \$3 million recurring appropriation, raising questions about PED’s efforts to ensure educators across the state are sufficiently prepared.

Kentucky developed a “Leadership Network” to support NGSS professional development in each region. Each educational cooperative hired a teacher to serve as a science specialist to develop training for their region.

PED held a STEM symposium during the summers of 2017 and 2018 covering a variety of topics related to pedagogy, sample lessons, implementation, content integration, and assessment. LESC requested information on the number of participants, school districts represented, and the cost of the symposium, but PED has not provided the requested information. PED also offers webinars about planning instruction around phenomena, NMSRSS innovations, and exploring three-dimensionality. PED expects that all classrooms are in full implementation of NMSRSS during the 2018-2019 school year although it is unclear if all New Mexico science teachers have had access to comprehensive professional development.

Instructional Materials

Phenomena-driven lessons are lessons in which students investigate compelling natural phenomena to engage in science and engineering practices. An example would be solving problems such as: Why is there a beetle infestation?; Why isn’t rainwater salty?; and How did the solar system form?

NMRSS-Aligned Instructional Materials: Minimum Base Cost

Grade Band	Estimated Cost Per Student
Elementary School	\$79.66
Middle School	\$113.50
High School	\$90.63

Source: NMSTA

Effective implementation of NGSS requires quality instructional materials that support phenomena-driven, three-dimensional learning, as well as the other innovations of NGSS. State education agencies and school districts should develop a strategy for obtaining instructional materials that are designed for NGSS and ensuring existing materials can be used during the transition to the new standards. The strategy should include plans for what will happen during the transition time; how materials will be vetted; how materials will make it to the classroom in a timely manner; and how educators will be trained to use them properly during their instruction. To ensure consistency in the quality of instructional materials across the state, Achieve recommends that STEM instructional materials should be reviewed by a committee and examined against specific criteria. The committee should agree on a set of criteria that will be used to vet all the materials, and all members of the committee should be trained and calibrated on how to use these criteria. Finally, existing materials should be audited to verify NGSS alignment.



School districts and charter schools were originally scheduled to purchase new science materials during the FY19 school year, the same year the new standards were expected to be in full implementation; however, PED delayed the same adoption cycle until FY20 amid budget concerns in FY19 and to ensure new science standards had been adopted prior to the scheduled instructional materials review and scheduled adoption cycle. Science adoptions tend to be more expensive than some other adoption cycles; the cycle covers materials for elementary, middle and high school students. In FY13, the last year funds were appropriated for a science adoption cycle, the Legislature appropriated a total of \$28.5 million for instructional materials. The New Mexico Science Teachers Association (NMSTA) indicates costs for text books could range between \$80 and \$115 per science textbook depending on grade level. Over the past few years, appropriations for text books have significantly decreased; in FY19, the Legislature appropriated \$10.6 million for instructional materials.

Arkansas instructs teachers to use the NGSS and National Science Teachers Association resources as instructional materials.

PED expects that all classrooms are in full implementation of NMSRSS during the 2018-2019 school year although materials currently in schools are not confirmed to be aligned.

Assessment

Educators need feedback about whether their approaches are moving students toward the rigorous three-dimensional performance goals as described in NGSS. The adoption and implementation of new standards will require implementation of new assessments to monitor and provide feedback to students, parents, educators, and leaders about what decisions – programmatic, resource allocation, and instructional – need to be made to improve outcomes for all students. Furthermore, many federal and state rules require some sort of assessment and reporting of science performance. Quality science assessment plans ensure stakeholders have access to varied information from different kinds of assessment opportunities and have adequate support for analyzing and interpreting assessment data to make improvements, though in practice this often means most assessment decisions are left to the school or classroom. Good assessments – administered at the state, school district, and classroom levels – are consistent with what should be happening during instruction in the classroom. Large-scale assessments provide the signal to inform what instruction should look like, and classroom assessments provide the lever to get there.

The New Mexico Standards-Based Assessment in Science is administered to students in fourth, eighth, and 11th grades. The exam was aligned with the previous kindergarten through 12th grade science standards, but with the recent introduction of the NMSRSS, New Mexico will need to develop and implement a new science exam aligned to the new standards. The department expects to have an aligned-assessment in place by the 2019-2020 school year, though it is unclear the work will be completed by the 2019-2020 school year as the assessment adoption process is lengthy and an RFA for a NMSRSS-aligned assessment has not been published. See **Attachment 2, Science Standards Implementation Timeline.**

State expectations are that students are taught the new NMSRSS during the 2018-2019 school year but will be assessed using the old New Mexico Standards-Based Assessment, which is aligned to old standards. It is unclear how this will impact performance on the old assessment and how it will impact school grades during the 2018-2019 school year, which is the first year science test scores will be included in school grades as required pursuant to the federal Every Student Succeeds Act.

This response was prepared for Andrea Ochoa, Legislative Education Study Committee, New Mexico

Your Question:

You asked what other states that have adopted the Next Generation Science Standards (NGSS) are doing regarding professional development, materials and spending.

Our Response:

Nineteen states and the District of Columbia have adopted NGSS. These states include Arkansas, California, Connecticut, Delaware, Hawaii, Illinois, Iowa, Kansas, Kentucky, Maryland, Michigan, Nevada, New Hampshire, New Jersey, Oregon, Rhode Island, Vermont and Washington.

ECS reviewed SEA websites and reached out to the science coordinator at each of the 20 SEAs to collect information for this response.

Professional Development

Arkansas: The Arkansas Department of Education has developed [NGSS-aligned professional development](#) that are delivered through [Educational Service Cooperatives](#) (regional service providers) and [university STEM Centers](#).

District of Columbia: About \$700,000 in Title II B funds was granted to institutions of higher education and community partners to scale NGSS professional development to explore NGSS practices. Professional development efforts were framed as “1.0” and “2.0.” 1.0 was “Introducing the Next Generation Science Standards for LEAs and School Leaders”; 2.0 was “Understanding the Shifts in Practice for LEAs and School Leaders.” Professional development included deep engagement with the [Framework for K-12 Science Education](#). Out of school educators were trained alongside classroom teachers.

Years 1 through 3 focused on engaging with roughly 72 LEA or district leads in DC to support high-quality NGSS implementation. Each LEA lead developed an implementation plan for his/her own district by participating in a State Science Leadership Team meeting for three hours every month. There was no additional cost associated with this activity—existing OSSE staff supported this work.¹

Illinois: See response under “Spending” below.

Kentucky: Each of the state’s eight [educational cooperatives](#) developed a “Leadership Network” to support NGSS professional development for districts in its region. Each educational cooperative temporarily hired a teacher to serve as a science specialist, who was paired with a Kentucky Department of Education staff person and a higher education representative [usually a faculty member in education, but sometimes a faculty member in the institution’s science department] to develop training for their region.

Each district was invited to send one elementary, one middle and one high school teacher whose primary focus was in science, to Leadership Network activities, which included monthly meetings six months a year, as well as a two-day summer workshop. Participating teachers were expected to provide NGSS training to other teachers in their districts.

The Leadership Network process went on for three years.²

Materials

Arkansas: The Arkansas Department of Education’s [FAQ for K-12 science standards](#) directs teachers to [NSTA](#) and [NGSS](#) resources.

District of Columbia: In Years 3 and 4 of NGSS implementation, instructional materials development began. The state spent a fair amount of funds providing rubric training, including \$30,000 on training on Achieve EQulP Rubric. For districts hoping to tweak or write their own standards, OSSE ran cohorts of 30-60 teachers each to participate in Achieve EQulP training. Participating teachers received stipends.³

Illinois: See response under “Spending” below.

Kentucky: The Leadership Networks described in the “Professional Development” section above developed numerous curriculum resources and instructional supports.⁴

Spending

Arkansas: “There was money early on allocated for the creation and initial implementation of NGSS. It is now rolled into our STEM budget (CS is still separate).”⁵

California: The California Department of Education “does not have a specific funding amount allocated for NGSS. There are many moving parts involved in implementing standards including but not limited to the development of the standards themselves, the standards framework, and instructional materials.”⁶

District of Columbia: Approximately \$700,000 in Title II B funds were used to support efforts between institutions of higher education and community partners to scale NGSS professional development.⁷

Hawaii: The state department of education has “had about \$2M allocated to PD over ~3 years, starting last year. Those funds were earmarked by our previous superintendent. In addition to that, I’ve had a budget of ~\$50,000 each year for the past 4 years to run things like work groups, meetings, etc. Due to shifts in budget priorities, I have no budget this year.”⁸

Illinois: While the state has not allocated funds specifically to NGSS implementation, the Illinois State Board of Education has contracted with Illinois State University for \$2 million a year to support implementation of all content standards, including teacher professional development and development of curriculum/instructional resources.⁹

Kentucky: Uncertain of dollar amount spent on NGSS activities. Efforts may have been supported in part by Bill and Melinda Gates Foundation funds.

New Jersey: “The legislature provides \$1.3 million for Liberty Science Center to provide services in support of NGSS implementation.

“We had Title II Part B funding. We spent [approximately] \$2 million annually on PD.”¹⁰

Washington: “in the last session, science received a \$4 million proviso to do NGSS training including climate science education. It is one year funding. Otherwise, we have relied on math/science partnership funding which ended this year.”¹¹

¹ Phone interview with Maya Garcia, Office of the State Superintendent of Education, October 12, 2018.

² Phone interview with Rae McEntyre, Division of Program Standards, Kentucky Department of Education, October 12, 2018.

³ Maya Garcia, October 12, 2018.

⁴ Rae McEntyre, October 12, 2018.

⁵ Email communication with Anthony Owen, Chief State STEM Officer and State Director of Computer Science Education for the Arkansas Department of Education, October 12, 2018.

⁶ Email communication with Lisa Fassett, Standards Implementation Support Office, Educator Excellence and Equity Division, California Department of Education, October 12, 2018.

⁷ Maya Garcia, October 12, 2018.

⁸ Email communication with Lauren Johanna Kaupp, Educational Specialist for Science, Hawaii Department of Education, October 12, 2018.

⁹ Email communication with Marci Johnson, Director of Curriculum and Instruction, College and Career Readiness, State CTE Director, Illinois State Board of Education, October 12, 2018.

¹⁰ Email communication with Michael Heinz, New Jersey Department of Education, October 12, 2018.

¹¹ Email communication with Ellen Ebert, Washington Office of Superintendent of Public Instruction, October 12, 2018.

SCIENCE STANDARDS IMPLEMENTATION TIMELINE

“Our STEM Community working together for kids”



2017–2018
School Year

Standards

2003 New Mexico state science standards taught in all grades

Professional Learning

PED provided professional learning:

- Teacher and administrator webinars, Spring 2018
- Administrator Leadership Day, May 2018
- NM STEM Symposium, June 2018
- Making Sense of SCIENCE (MSS) teacher institutes, June 2018

Curriculum & Instruction

- Readiness inventories released for teachers and administrators
- Science instructional materials identified and reviewed
- Secondary course map recommendations released, Spring 2018

Assessment

Current New Mexico Standards Based Assessment (SBA) for students in grades 4, 7, and 11

Current End of Course (EoC) exams for all science courses

2018–2019
School Year

Standards

New Mexico STEM Ready! science standards taught in all grades

Professional Learning

Teacher/administrator professional learning should include:

- Instructional shifts, 3-dimensionality, content knowledge, classroom formative assessments

PED will offer:

- Teacher and administrator webinars
- Leadership training
- NM STEM Symposium, June 2018
- Making Sense of SCIENCE (MSS) teacher institutes

Curriculum & Instruction

- State adopted instructional materials list available, Fall
- NM STEM Ready! science aligned instruction occurring in all classrooms
- Field test of open source aligned middle school units

Assessment

SBA remains the same for students in grades 4, 7, and 11

*Blended science EoCs

Field test new summative assessment in grades 5, 8, and 11

2019–2020
School Year

Standards

New Mexico STEM Ready! science standards taught in all grades

Professional Development

Ongoing **teacher/administrator** professional learning should include:

- Instructional shifts, 3-dimensionality, content knowledge, classroom formative assessments

Curriculum & Instruction

- NM STEM Ready! science aligned instruction occurring in all classrooms

Assessment

NM STEM Ready! science aligned summative assessments administered in grades 5, 8, and 11

NM STEM Ready! science aligned EoCs administered