FALL 2021

Data Snapshot

K–12 Science Materials

edreports

INTRODUCTION

A Framework for K-12 Science Education (the Framework) was published, leading to the development of the Next Generation Science Standards (NGSS) and multiple state standards that use the Framework as their foundation. As of 2021, 20 states have adopted the NGSS and 24 use standards informed by the Framework.

Public opinion of the NGSS is high. A recent study published by AERA found that the NGSS is popular with educators, and that feeling of positivity continues to increase year over year in both NGSS and non-NGSS states.[1] But when it comes to instructional materials aligned to the standards, materials are not supporting this vision for science education.

A new report, *Call to Action for Science Education,* from the National Academies of Sciences, Engineering, and Medicine found that "for many students, instructional materials, supplies, and other critical curriculum resources are insufficient," and while high-quality instructional resources are starting to be more available "...many students are still provided with out-of-date textbooks and have their laboratory or investigation work limited by a lack of material and supplies."[2]

In order for the instructional innovations laid out in the Framework and NGSS to take hold, teachers need high-quality instructional materials that support students to figure out a contextualized phenomenon or solve a problem using science ideas and practices rather than learning about an isolated science topic.[3]

EdReports is tracking the curriculum market to identify how well products support this learning. It analyzes the marketplace based on reviews of the comprehensive materials available for districts and schools to adopt, data from the nationally representative RAND American Instructional Resources Survey, and other research on what is being used in classrooms.[4]

Teachers That Say Their Schools Are Implementing The NGSS Are More Likely To Report Their Students Engage In Deeper Science Learning

Nearly half of all teachers indicate their schools are implementing the NGSS; one fifth of science teachers report not knowing what standards are in use. Specifically, middle school and high school teachers are more likely to be at a school implementing the standards and to be aware of those standards than teachers at the elementary level.

Survey Question: "Is your school currently implementing the Next Generation Science Standards (NGSS) standards?"

	Elementary School	Middle School	High School	Total (Elementary, middle, and high school)
School is implementing the NGSS	43.9%	61.6%	51.5%	48.5%
School is not implementing the NGSS	30.3%	28.7%	33.2%	30.8%
Do not know	25.8%	9.8%	15.3%	20.7%
Total	**100%**	**100%**	**100%**	**100%**

Teacher knowledge of what standards their school is implementing is important because it is associated with how often students engage with the NGSS three dimensions (Crosscutting Concepts, Science and Engineering Practices, and Disciplinary Core Ideas) that help students build a cohesive understanding of science over time.

Teachers who know that they are using the NGSS report that their students are engaged more frequently in deeper science learning and practices called for in the standards and in the Framework. Those that indicate that they are not implementing or do not know whether they are implementing the NGSS report less time engaged in similar practices. For example, middle school teachers who know they are using NGSS are more than twice as likely (46% versus 22%) to report a majority of their students using engineering design processes to develop solutions to problems.

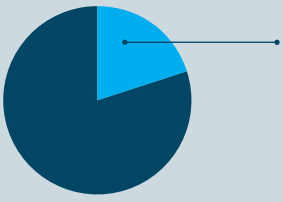
Survey Question: "In this school year, what proportion of your students typically engage in each of the following activities at least once a week for the science classes you teach?"

	Student Activities	Teachers that report they are implementing NGSS		Teachers that report they are not implementing NGSS or do not know	
		≤50% of students	> 50% of students	≤50% of students	> 50% of students
Elementary	Justify their scientific thinking verbally or through a model	**40%**	**60%**	**56%**	**44%**
	Analyze or interpret data	**38%**	**62%**	**46%**	**54%**
Middle	Construct their own explanations and arguments	**29%**	**71%**	**44%**	**56%**
	Use engineering design processes to develop solutions to problems	**54%**	**46%**	**78%**	**22%**
High	Plan and carry out a scientific exploration	**36%**	**64%**	**45%**	**55%**
	Obtain, evaluate, or communicate information about a phenomenon	**34%**	**66%**	**52%**	**48%**

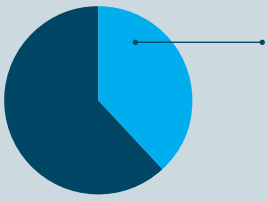
Teachers Lack Access to High-Quality Materials and Aligned Professional Learning

High-quality instructional materials and participation in curriculum-based professional learning are two of the most important levers to ensure students have access to science learning that will prepare them for success for school and beyond. Unfortunately, neither is widespread. While teachers who report using the standards are more likely to engage in important practices that are central to NGSS, access to high quality materials to support it is a challenge for all educators.

EdReports is early in its efforts to review science materials. We began with middle school materials, most recently expanded into K-5 materials, and will soon begin reviewing high school curriculum. Therefore, we are not yet able to provide comprehensive information about which K-12 science programs are aligned to the Framework and the standards. Yet, data indicate that teachers are not equipped with aligned content. For example, 20% of teachers regularly use materials that pre-date the standards, meaning that these materials were designed without any consideration for the instructional innovations in the NGSS.



20% of science teachers regularly use pre-standards materials



42% of science teachers regularly use materials they create themselves.

Additionally, 42% of science teachers are devoting time and energy to creating their own materials—a practice that is born of necessity, but one that research shows means students are less likely to receive consistent grade-level content or meet grade-level standards.[5]

The use of pre-standards materials and teacher created materials indicate that students may not have regular access to key features of the Next Generation Science Standards including three-dimensional and problem based-learning within and across lessons. Where we do have market data in middle school science programs, very few are aligned to the NGSS (see middle school science spotlight).

Science teachers do not have opportunities to regularly collaborate with other teachers or regularly participate in curriculum-based professional learning. Finding recent and aligned materials is a challenge for teachers that is exacerbated by not having opportunity for any regular support around their materials. Over half of science teachers report never receiving coaching or workshops on the use of their instructional materials. In addition, over a third say they have no collaborative time with colleagues around curricula. Yet, research shows that engaging in curriculum-specific professional learning can improve student outcomes.

Science teachers are also less likely than their counterparts in math and ELA to get content-specific professional development. Only 41% report receiving a full day of science professional development, compared with ELA at 73% or math at 66%.[6]

Survey Question: "This school year, how often have you participated in the following types of professional learning activities?"

	% by response category				
	Never	1-3 times per year	4-6 times per year	1-3 times per month	Weekly or more often
Workshops or trainings focused on use of my main science materials	50%	44%	5%	1%	0%
Coaching focused on use of my main science materials	69%	24%	3%	2%	1%
Collaborative learning with other teachers (e.g., Professional Learning Communities) focused on use of my main science instructional materials	35%	28%	11%	13%	13%

SPOTLIGHT ON MIDDLE SCHOOL SCIENCE

As of September 2021, EdReports has reviewed 78% of comprehensive middle school science materials that claim to have been designed for the Next Generation Science Standards or based on the Framework. The reports illuminate trends in science curricula, particularly the areas in which programs succeed or not in incorporating the innovations called for in these standards.

Trends in Middle School Science Materials

- Assessments—both formative and summative—frequently fail to measure stated objectives for three-dimensional learning.
- Most materials do not consistently provide phenomena and problems that consistently drive learning and use of the three dimensions. Materials also rarely leverage student knowledge and experiences related to phenomena or problems.
- Materials that do meet expectations for three-dimensional learning also incorporate Science and Engineering practices well, in particular *developing and using models* and planning and carrying out investigations.

Of science teachers whose main instructional materials are not aligned to standards:

42% create their own materials.

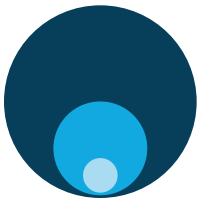
54% modify half or more of a typical lesson in order to better address the content in their subject area.

Pre-standards and out of publication materials are still prevalent in middle school classrooms

39% of teachers use pre-standards materials regularly.

19% of teachers use pre-standards materials for more than a quarter of instructional time

7% of teachers are using pre-standards materials for half or more of instructional time.



Use of High-Quality Instructional Materials

Teachers report that they are using a variety of materials, the vast majority of which do not support the instructional innovations in the Framework or NGSS.

Percentage of Middle School Teachers Regular Use of Science Instructional Materials by Alignment Category*	
At least one aligned curricula	7.1%
At least one partially aligned curricula	6.0%
Unaligned curricula	30.7%
Unrated but will review	12.2%
Not reviewable or reviewability not determined*	43.9%
Total	100%

**Not reviewable means that materials are either 1) not comprehensive, 2) have no claim of standards alignment by the publisher, 3) pre-NGSS or no longer being actively sold by publisher, or 4) other curriculum not listed. Reviewabilty not determined means that the respondent marked "Other."*

Only 7% of middle school teachers are supported by an aligned curriculum.

The lack of access to high-quality instructional materials leads to more work for teachers.

Teachers spend 7–12 hours per week searching for and creating instructional resources, drawing from a variety of sources, many of them unvetted.[7] This is time that could otherwise be used to to meet the individual needs of students and provide supports to ensure all students are college and career-ready.

TAKE ACTION: IMPROVE THE QUALITY OF SCIENCE INSTRUCTIONAL MATERIALS

1. **States, districts, and school systems:** The majority of teachers and students in the country are in states that have standards informed by the Framework and/or the NGSS. Despite these having been in place for multiple years, many science teachers still do not know what their science standards are. Districts, and schools in Framework-informed or NGSS states should invest in professional development that provides clear information to teachers about their state standards, the innovations these standards call for, and implications for instructional materials to support and focus their instructional vision.

2. **District and school leaders:** Learn what instructional materials are in use in classrooms. What do EdReports reviews show are your program's strengths and gaps? What is the copyright date? How have teachers been using or modifying the materials? If quality materials are not in use, advocate for and help select new curriculum that will support students to engage with rich science content. Districts have the power and the tools to demand publishers create instructional materials designed for the innovations in the NGSS.

3. **District and school leaders:** Ensure that any curriculum strategy includes curriculum-specific professional development that supports teachers to understand grade-level content standards, learn how to use their materials, and collaborate with others to plan and assess progress.

4. **Teachers:** Work with your school and district leaders to prioritize high-quality materials and the professional learning you need to implement it well. Equip yourself with the information you need to be able to advocate for the resources you deserve. Share data from EdReports reviews with leadership and colleagues. Consider this resource that illustrates and provides unified definitions of design features while navigating the materials landscape. Educators play a pivotal role in creating the demand for any developer of science content to incorporate critical NGSS features to meet local needs, including the expectations of their state standards.

Interested in more information about the curriculum markets? Explore these other resources to learn more about what materials are in use in classrooms nationwide.

Teachers' Lesson Modifications for Students with Disabilities (RAND)

State of the 2020 Market: The Use of Aligned Materials (EdReports)

K–12 Teachers' Use of and Access to Science-Specific Instructional Materials, Feedback, and Professional Learning (RAND)

END NOTES

1. Rosenberg, J. M., Borchers, C., Dyer, E. B., Anderson, D., & Fischer, C. (2021). Understanding public sentiment about educational reforms: The Next Generation Science Standards on Twitter. *AERA Open*. https://doi.org/10.1177/23328584211024261

2. National Academies of Sciences, Engineering, and Medicine. (2021). *Call to action for science cducation: building opportunity for the future.* Washington, DC: The National Academies Press. https://doi.org/10.17226/26152

3. EdReports.org and NextGenScience. (2021). *Critical features of instructional materials design for today's science standards.* San Francisco, CA: WestEd. https://www.nextgenscience.org/sites/default/files/CriticalFeaturesInstructionalMaterials_July2021.pdf

4. RAND American Educator Panels, American Teacher Panel, "American Instructional Resources Survey." RAND2020_05MAY_AIR0520T, RAND Corporation, Santa Monica, CA, May 05, 2020.

5. TNTP. (2018). *The opportunity myth: what students can show us about how school is letting them down -- and how to fix it*. New York: TNTP, Inc. https://tntp.org/assets/documents/TNTP_The-Opportunity-Myth_Web.pdf

6. Doan, S. & Lucero, A. (2021). *Changing the subject: K–12 teachers' use of and access to science-specific instructional materials, feedback, and professional learning.* Santa Monica, CA: RAND Corporation. https://www.rand.org/pubs/research_reports/RRA134-7.html

7. Goldberg, M. (2016). *Classroom trends: teachers as buyers of instructional materials and users of technology.* Shelton, CT: MDR. https://mdreducation.com/reports/classroom-trends-teachers-buyers-instructional-materials-users-technology

ABOUT EDREPORTS

EdReports is an independent nonprofit designed to improve K-12 education. EdReports increases the capacity of teachers, administrators, and leaders to seek, identify, and demand the highest-quality instructional materials. Drawing upon expert educators, our reviews of instructional materials and support of smart adoption processes equip teachers with excellent materials nationwide. EdReports and associated marks and logos are the trademark property of EdReports.org, Inc.

LIMITED PRINT AND ELECTRONIC DISTRIBUTION RIGHTS