WINTER 2022

2022 DATA SNAPSHOT

K-12 Science Instructional Materials

edreports

INTRODUCTION

Research shows that students learn primarily through their interactions with teachers and content. Because of the critical role materials play in supporting teachers and students, it is vital for all stakeholders to have a better understanding of the materials market, including what's available, what's in use, and how states and districts can support educators to use high-quality curriculum that makes a difference in classroom practice and the instruction students receive.

In the decade since "A Framework for K–12 Science Education" (Framework) and the development of the Next Generation Science Standards (NGSS), educators have been calling for high-quality instructional materials that support students to gain the knowledge and skills they need to be college- and career-ready. Yet, when it comes to available programs, there are very few that meet EdReports criteria for alignment and usability. The vast majority of teachers do not have access to the resources they need and deserve.

This report focuses on K–12 science curriculum and analyzes teacher perceptions of their materials, what they prioritized in the content they are using, and how they felt their materials measured up to those expectations. In addition, we explored important factors that influence the use of high-quality materials, such as access to curriculum-aligned professional learning. Our analysis brings together teachers' experiences* and what EdReports has learned from reviewing science curriculum.

This Data Snapshot includes information about:

- The availability of quality K–12 science programs and how regularly these materials are used by teachers.
- The extent to which materials provide culturally relevant content and support a diversity of student needs, including those of multilingual learners.
- Important factors that influence the use of quality materials, such as ongoing access to curriculum-aligned professional development.

This study draws upon data from EdReports reviews, copyright dates, and data from the RAND Corporation American Instructional Resources Surveys (AIRS) on curriculum use, teacher perceptions, and school context.

Key Findings

1. Teachers lack access to high-quality, standards-aligned science instructional materials.

As of September 2022, 20 states had adopted the Next Generation Science Standards and 24 use standards informed by the Framework for K-12 Science Education. An overwhelming 96% of science teachers say that materials aligned to their state's science standards are somewhat or extremely important to them. Yet only 37% believe their materials meet this need (responses 6 and 7 on table 6). When it comes to what's actually in use in classrooms, aligned core curricular science programs are noticeably absent.

EdReports' reviews of K–8 science materials find that there are limited sets of materials that meet expectations for supporting the crucial innovations laid out in the Framework and the NGSS. As of December 2022, EdReports had reviewed 80% of core science curricular materials used in grades 6–8 classrooms and found that only one program meets expectations.

For K–5 classrooms, EdReports has reviewed 46% of core curricular materials and found that no programs meet expectations. EdReports has heard from multiple publishers that are working to improve existing products and create new ones. If content developers attend to the alignment and usability gaps identified in this Data Snapshot report and others, it could mean that science teachers will soon be able to choose from multiple standards-aligned products.

The current lack of aligned materials may impact what is taught in the classroom. Only 30% of teachers indicate that they use any core programs as their primary instructional materials. This contributes to classroom environments in which the majority of resources used are supplements. In fact, half of all science teachers indicate that they use supplements as their primary source of materials. This reliance on supplements can have a significant impact on coherence, as it is much harder to develop a coherent learning experience for students when trying to piece multiple lessons from multiple sources together into a year's worth of learning and across multiple years.

Table 1 Availability of aligned science materials

Grade band	% of Reports that Meet Expectations	% of Reports that Partially Meet Expectations	% of Reports that Do Not Meet Expectations
Elementary	0 (N = 0)	33.3 (N = 6)	66.7 (N = 12)
Middle	6.7 (N = 3)	20.0 (N = 9)	73.3 (N = 33)

Note: We define the "core curriculum market" as comprehensive, core science materials in circulation reported by rates of teacher use. This excludes materials that are created directly by teachers or the school or district in which they work, supplemental materials that do not comprise a comprehensive yearlong scope and sequence, and curricula no longer being actively sold by publishers. EdReports has reported on the materials in use by 46% of elementary teachers and 80% of middle school teachers who use comprehensive core science curriculum nationwide.

Table 2 Percentage of teachers reporting regular use of science curriculum by standards-alignment rating and material type

Grades	Elementary Grades	Middle Grades	High School Grades	Total
At least one aligned curriculum	0.0%	6.7%	0.0%	1.4%
At least one partially aligned curriculum	4.1%	10.0%	0.0%	4.4%
Non-aligned curricula	6.2%	16.2%	0.0%	6.9%
Under review by EdReports	4.6%	1.8%	0.0%	2.9%
Comprehensive curriculum not reviewed	7.2%	6.2%	7.7%	7.1%
No longer actively sold by publisher	5.9%	7.7%	0.0%	4.9%
Curriculum with no standards-alignment claim	0.0%	0.0%	1.8%	0.4%
Non-comprehensive curriculum	12.5%	0.1%	2.5%	7.6%
Supplemental program	47.7%	45.1%	63.0%	50.7%
Other curriculum not listed on survey	6.3%	2.8%	14.4%	7.4%
Created by the school or district	3.6%	3.1%	9.0%	4.8%
Created by the classroom teacher	0.4%	0.0%	1.2%	0.5%
No particular curriculum	1.6%	0.1%	0.3%	1.0%

Question Text: Among the science curriculum materials in this list, select any materials you use regularly (once a week or more, on average) for your science instruction this school year (2020-21). Indicate which additional instructional materials – beyond curriculum materials – you use regularly (once a week or more, on average) for your science instruction this school year (2020–21).

2. Research shows that ongoing professional learning is key to implementing high-quality instructional materials. However, few science teachers have access to consistent learning opportunities that prepare them to use materials with integrity.

"The Elements: Transforming Teaching through Curriculum-Based Professional Learning," defines curriculum-based professional learning as having at its core: "rigorous, standards-aligned curriculum with guidance for teachers on what to teach and how to use the instructional materials; transformative learning experiences that shift teachers' beliefs, perceptions, and practices; and the development of teachers' understanding of how to prioritize and promote equity through high expectations and culturally relevant instruction." These elements are critical in order to transform the learning environment for students and ensure that they are gaining the skills, knowledge, and experiences they need for postsecondary and career success.

Access to curriculum-focused science professional learning is especially difficult since only a quarter of teachers report using any core comprehensive curriculum products. Therefore, it is not particularly surprising that 28% of science teachers receive no curriculum-focused professional development. Further, two-thirds of science teachers report receiving zero to five hours annually of ongoing support related to their instructional materials.

When science teachers do have access to professional development, they often are not satisfied with the support they receive. While elementary school teachers are more likely to say that their professional development prepared them to at least a moderate extent, 28% of middle school teachers and 32% of high school teachers indicate that their professional development did not prepare them at all to use the provided curriculum.

Given how important professional learning is for the successful implementation of high-quality materials, these numbers signal a clear need for states and districts to invest in ongoing professional development to support teachers with their curriculum. This urgency will only rise as aligned science materials increase in availability and districts begin to invest in new programs.

Table 3 Access to professional learning activities on how to implement main science instructional materials

Hours of professional learning	Elementary Grades	Middle Grades	High School Grades	Total
0 hours	28.8%	25.8%	28.3%	28.0%
1–5 hours	38.4%	37.8%	35.8%	37.7%
6–10 hours	16.2%	18.4%	14.2%	16.2%
11–20 hours	7.6%	4.7%	9.5%	7.4%
More than 20 hours	5.5%	12.4%	10.9%	8.2%

Question Text: Since the end of last school year (2019-20), how many hours did you spend in professional learning activities related to the following topics in science: Learning how to implement my main instructional materials?

Note: "Percentages may not sum to 100% due to rounding error and missing data at 3.5% for elementary, 1.0% for middle school, 1.3% for high school grades, and 2.5% for total."

Table 4 Quality of professional learning activities to use science curriculum materials provided by school or district

Extent of preparation	Elementary Grades	Middle Grades	High School Grades	Total
Did not prepare me at all	15.2%	27.8%	31.9%	21.7%
Prepared me to a slight extent	30.7%	29.0%	28.4%	29.8%
Prepared me to a moderate extent	40.6%	33.9%	31.9%	37.2%
Prepared me to a great extent	10.3%	8.3%	6.6%	9.0%

Question Text: To what extent have professional learning opportunities provided by your school or district this school year (2020–2021) prepared you to use curriculum materials provided by your school or district?

Note: Percentages may not sum to 100% due to rounding error and missing data at 3.2% for elementary, 1.0% for middle school, 1.3% for high school grades, and 2.3%for total.

3. Science teachers want materials that center and engage all students and include content and approaches that are culturally relevant. But few teachers believe their materials meet these needs.

Research continues to demonstrate that high-quality materials that center and celebrate student experiences can help foster a sense of belonging, leading to improved academic performance. The content students have access to influences whether they feel included and affirmed. Materials that highlight multiple representations—including in texts, literature, media, and images—serve to engage all students through content that are relevant and relatable. This is particularly significant for students of color and students living in poverty who have less access to high-quality, standards aligned content than their peers.

As we are seeing in many subject areas, there is a demand for instructional materials that address a broader definition of quality such as: supports for multilingual learners, content and approaches that are culturally relevant, centering students' experiences, and tools, and supports for differentiation to meet individual student needs. It's no surprise that science teachers place importance on these components as well.

Seventy-three percent of science teachers say materials that include support for multilingual learners are somewhat or extremely important to them. A still higher 81% of science teachers cite "content and approaches that are culturally relevant" as somewhat or extremely important to them. Nearly all teachers prioritize materials that will engage all students and can be adapted to meet the needs of all learners.

However, when it comes to the materials teachers are using, less than a quarter of science teachers describe their curriculum as adequate or completely adequate in meeting the needs of multilingual learners. An even lower 17% say their materials support them to provide culturally relevant instruction (responses 6 and 7 on table 6).

Table 5 Importance teachers place on various characteristics of science instructional materials

Characteristic	Not important	Slightly important	Somewhat important	Extremely important	Missing data*
Will be engaging or compelling to my students	0%	1%	14%	85%	0%
Are easy to adapt to meet needs of my students	0%	3%	29%	67%	1%
Include content and approaches that are culturally relevant	3%	16%	42%	39%	1%
Include supports for English Learners	9%	18%	37%	36%	1%
Are aligned with my state's science standards	1%	3%	23%	73%	1%

Question Text: 'Indicate the importance you place on various characteristics of science instructional materials when choosing which materials to use in your mathematics classroom lessons.

*Note: Percentages may not sum to 100% due to rounding error and 1% missing data.

In chapter 11 of the Framework, "Equity and Diversity in Science and Engineering Education," and NGSS Innovation number 5, "All Standards, All Students," the importance of culturally relevant and engaging curriculum and opportunity gaps in science education are directly addressed. The Framework and the NGSS aim to ensure that students from diverse backgrounds and with diverse needs can "maintain both achievement and agency in science" and uphold the expectation that "all students should have adequate opportunities to learn."

The Framework calls out that a commitment to equity is central to realizing the promise of high standards: "The development of common and rigorous standards for use with all students rests on the assumption that all students are provided with similar learning opportunities. Issues related to equity and diversity become even more important when standards are translated into curricular and instructional materials and assessments."

While NGSS innovations 1–4 focus on the "what" of the standards, innovation 5 highlights how components of the NGSS can be used to support each and every student with specific implications for science instructional materials. The innovation directly states: "Science instructional materials support equitable access to science education for all students." This makes innovation 5 particularly relevant to the science instructional materials market and what materials are used in classrooms.

As science instructional materials are developed and selected, considerations for these vital components must be included. Teachers want them. Students need them. Curriculum cannot be truly high quality until it's accessible to all.

Table 6 Teachers' perception of science instructional materials adequacy

Curriculum purpose	1	2	3	4	5	6	7	N/A (Not Sure)	Missing Data*
Helping all students master my state's science standards	4%	2%	3%	31%	15%	21%	16%	6%	1%
Meeting the needs of students with IEPs or 504 plans	6%	7%	10%	29%	13%	13%	11%	9%	1%
Meeting the needs of English learners	8%	9%	12%	24%	12%	12%	9%	13%	1%
Accelerating the learning of students who are performing below grade level	6%	8%	14%	33%	14%	10%	7%	8%	1%
Helping me provide culturally relevant instruction	9%	10%	14%	24%	14%	9%	8%	11%	1%
Reflecting students' interests or experiences	5%	4%	10%	26%	19%	16%	13%	6%	1%
Providing real-world tasks or activities that have applications	4%	3%	7%	23%	20%	18%	17%	6%	1%
Reflecting the diversity of identities within my classroom	9%	11%	15%	22%	13%	9%	8%	12%	1%

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Table 6 Continued Teachers' perception of science instructional materials adequacy

Curriculum purpose	1	2	3	4	5	6	7	N/A (Not Sure)	Missing Data*
Centering the knowledge, experiences, and contributions of diverse groups of people across varied membership groups (e.g., race, gender, socioeconomic status, ability status)	11%	10%	13%	22%	13%	10%	9%	11%	1%
Helping my students develop positive social identities based on their memberships in multiple social groups (e.g., race, gender, socioeconomic status, ability status)	11%	11%	13%	21%	12%	9%	8%	13%	1%
Helping my students express comfort with and respect for the different dimensions of human diversity	10%	11%	14%	21%	12%	9%	7%	14%	1%
Helping my students recognize and understand individual-level bias and systemic injustice	15%	12%	15%	17%	10%	7%	6%	17%	1%
Helping my students determine appropriate action against bias and injustice	17%	12%	14%	18%	9%	6%	6%	18%	1%

Question Text: Indicate the extent to which the science curriculum materials provided by your district or school as a recommendation or requirement are adequate for each purpose listed below. Rating scale anchor categories: 1 (completely inadequate), 4 (adequate in some ways and inadequate in others), 7 (completely adequate).

*Note: Percentages may not sum to 100% due to rounding error and 1% missing data.

TAKE ACTION:

Improve the Quality of Science Instructional Materials

1. **District and School Leaders:** The data is stark—too few science teachers are using a core curriculum. Districts need to prioritize adoption processes to find high-quality instructional materials for their science classrooms. The first step is to understand the additional lift placed on teachers when there is not a core curriculum in place. How have teachers been finding, modifying, and using materials? What characteristics will be important in finding a strong core curriculum? At the heart of your adoption process, center the innovations of the NGSS and Framework along with local priorities. Leverage EdReports review criteria—it focuses on whether materials are designed for the NGSS and the Framework along with key features such as supports for multilingual learners and content that centers diverse student experiences. Ensure that your materials selection and implementation strategies include curriculum-aligned professional learning. This will support teachers to deeply understand grade-level content standards, learn how to use their materials with integrity, and collaborate with others to plan and assess progress. These activities need to be planned beyond the initial rollout year of a new curriculum. Make sure to institute feedback loops from science teachers to ensure that the professional learning is meeting their needs.

2. **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 the design features of quality science materials 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.

3. **Content Developers** The data show that too few teachers have access to comprehensive science curriculum and that they find their materials lacking in terms of helping students achieve state standards, supporting multilingual learners, and supporting culturally relevant education practices, among others. EdReports has heard from multiple publishers that are working to improve existing products and create new products. If content developers attend to the alignment and usability gaps identified in this report and others, it could mean that science teachers will soon be able to choose from multiple standards-aligned products.

END NOTES

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VISION

All students and teachers will have access to the highest quality instructional materials that will help improve student learning outcomes.

MISSION

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.

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